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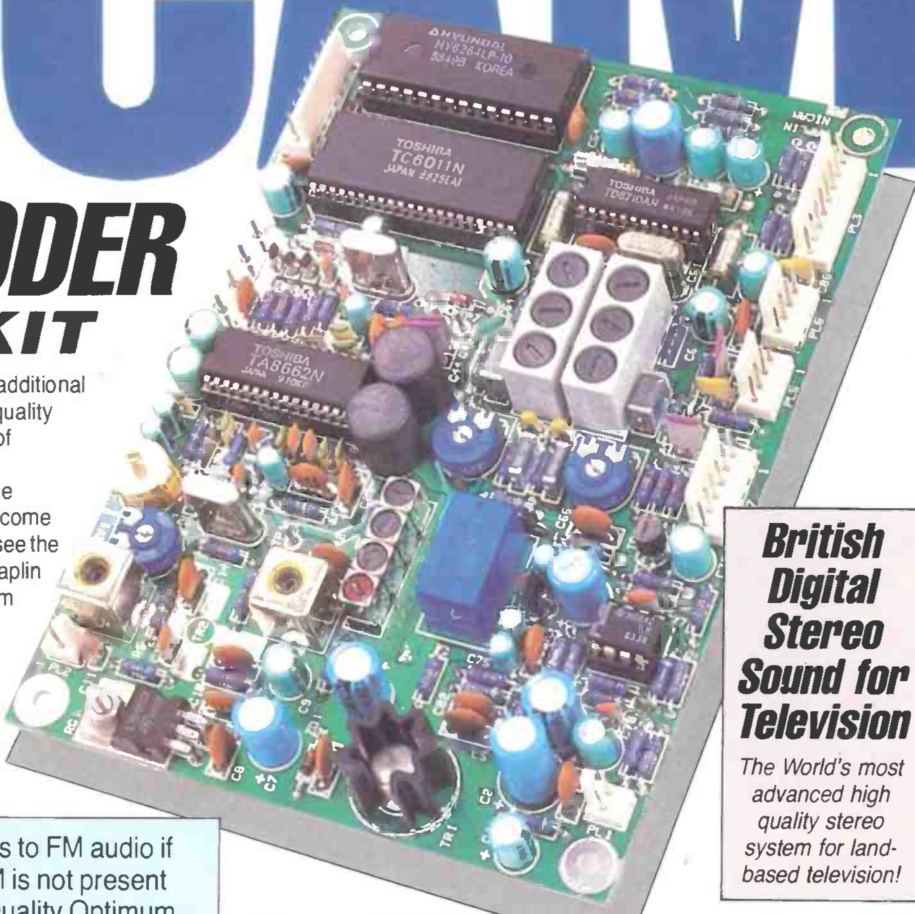

728 DECODER
PROJECT KIT

The Maplin NICAM 728 Decoder converts the additional digital code present* in the TV signal to a high quality stereo soundtrack with a quality similar to that of Compact Disc.

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*Currently being transmitted from Crystal Palace and Emley Moor. See the Maplin Magazine Issue 34 for IBA launch schedule.

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TELEVISION

January 1990

Vol. 40, No. 3
Issue 471

On sale December 20th

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", King's Reach Tower, Stamford Street, London SE1 9LS. Editorial correspondence should be addressed to "Television", IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE1 9LS.

INDEXES AND BINDERS
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Binders that hold twelve issues of *Television* are available for £4·50 from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques out to "Television Binders".

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this month

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AC141K	30p
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AC187K	28p
AC188	21p
AC188K	28p
ACY18	48p
ACY19	48p
AD142	100p
AD149	60p
AD161	35p
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BC640	20p
BCY32	200p
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ZTX501	13p
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ZTX503	18p
ZTX504	25p
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2N.697	22p
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2N.708	22p
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BY206	11p
BY207	11p
BY208	18p
BY210	22p
BY225	120p
BY226	18p
BY227	19p
BY228	32p
BY296	20p
BY298	26p
BY299	28p
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BYX55/350	30p
BYX55/600	30p
BYX70/500	32p
BYX70/800	36p
OA47	6p
OA90	6p
OA91	8p
OA200	7p
OA202	7p
IN.914	2p
IN.4001	4p
IN.4002	4p
IN.4003	4p
IN.4004	4p
IN.4005	4p
IN.4006	4p
IN.4007	5p
IN.4148	2p
IN.5400	9p
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IN.5403	11p
IN.5404	11p
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400MV BYZ88 RANGE 2V7 to 39V	6p
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CRYSTALS

Freq in MHZ

1.00	260p
2.00	200p
2.45670	180p
2.5	200p
3.276	115p
3.5795	95p
4.0	110p
4.194	130p
4.43	95p
4.9152	150p
5.0	130p
6.0	115p
8.0	125p
8.867	125p
10.0	140p
11.0	250p
12.0	120p
14.0	125p
14.756	200p
15.0	160p
16.0	130p
18.0	130p
18.432	130p
24.0	250p
48.0	160p

VOLTAGE REGULATORS

7805	35p
7806	35p
7808	35p
7812	35p
7815	35p
7818	35p
7824	35p
7905	35p
7906	40p
7908	40p
7912	40p
7915	40p
7918	40p
7924	40p
78L05	28p
78L08	28p
78L12	28p
78L15	28p
78L18	28p
78L24	28p
79L05	40p
79L08	40p
79L12	40p
79L15	40p
7818KC	100p
7824KC	100p
LM309K	100p
LM317K	220p
LM317T	180p
LM323K	420p
LM723	40p
78HGKC	570p
78HO5KC	800p
78H12KC	700p

78GU1C	190p
79GU1C	215p
79HGKC	800p

VALVES

DAF96	60p
DF96	50p
DL92	60p
DY86	60p
DY87	60p
DY802	75p
EABC80	60p
EB91	44p
EBF80	45p
EBF89	50p
ECC82	80p
ECC83	80p
ECC84	70p
ECC85	80p
ECH81	100p
ECH84	70p
ECL80	65p
ECL82	80p
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ECL85	70p
ECL86	90p
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EF183	78p
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EL34	250p
EL36	90p
EL84	75p
EL95	85p
EL500	100p
EL504	130p
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EY88	65p
EZ35	65p
EZ80	70p
EZ81	55p
GZ34	200p
PC97	100p
PCC85	60p
PCF80	80p
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PCL84	50p
PCL85	80p
PCL86	80p
PCL805	80p
PFL200	110p
PL36	120p
PL82	60p
PL83	60p
PL84	80p
PL95	180p
PL500	110p
PL504	120p
PL508	200p
PL519	450p
PY81	90p
PY88	70p
PY500A	190p

L.E.D.'s

LED 3MM RED	5p
LED 3MM YEL	10p
LED 3MM GRN	10p
LED 5MM RED	5p
LED 5MM YEL	10p
LED 5MM GRN	10p

RECTANG. L.E.D.'s

RED	10p
GREEN	15p
YELLOW	15p

LINEAR IC'S

AN-203	210p
AN-210	165p
AN-214Q	170p
AN-228	280p
AN-236	235p
AN-240P	150p
AN-241	135p
AN-245	290p
AN-247	230p
AN-252	150p
AN-259	250p
AN-262	140p
AN-271	230p
AN-272	480p
AN-274	250p
AN-301	330p
AN-303	250p
AN-304	360p
AN-305	320p
AN-315	210p
AN-316	350p
AN-318	460p
AN-360	100p
AN 362	140p
AN-366	150p
AN-610	160p
AN-612	160p
AN-5151	600p
AN-5612	400p
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TDA-3301B	380p
TDA-3303	400p
TDA-3310	120p
TDA-3420	250p
TDA-3501	400p
TDA-3502	600p
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TDA-3506	350p
TDA-3540	300p
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TDA-4442	320p
TDA-4445	250p
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TDA-4502	900p
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TDA-7220	150p
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TDA-7250	600p
TDA-7255	600p
TDA-7270	150p
TDA-7274	100p
TDA-8115	300p
TDA-8140	300p
TDA-8170	320p
TDA-8190	280p
TDA-8440	380p
TDA-9403	250p
TDA-9503	240p
TDA-9513	350p

LINEAR IC's — Cont.

TLO-81	40p
TLO-82	48p
TLO-83	67p
TLO-84	80p
ULN-2002	70p
ULN-2003	69p
ULN-2004	69p
ULN-2068	270p
ULN-2803	130p
ULN-2804	170p
UPC-16C	160p
UPC-20C	220p
UPC-554	130p
UPC-555	60p
UPC-556H	80p
UPC-566	60p
UPC-571	220p
UPC-574	60p
UPC-575C2	90p
UPC-576	200p
UPC-577	64p
UPC-580	300p
UPC-592	95p
UPC-595	190p
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UPC-1001	220p
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UPC-1020	200p
UPC-1023	60p
UPC-1025	230p
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UPC-1028	90p
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UPC-1032	60p
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UPC-1197	140p
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UPC-1397	450p
UPC-1403CA	750p
UPC-1420CA	500p
UPC-1458	100p
UPC-1470	200p
UPC-1504C	400p
UPC-1505C	400p
UPC-1517CA	400p
UPC-1525C	400p
UPC-1536C	550p
UPC-1571C	300p
ZN-423	100p
ZN-424	100p
ZN-425	320p
ZN-426	260p
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ZN-428	425p
ZN-429	215p
ZN-435	340p
ZN-448	510p
ZN-459	190p
ZN-1034	170p
ZN-1040	640p
ZNA 134H	2150p
ZNA-234E	920p

JAPANESE TRANSISTORS

2SA-473	35p
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2SA-509	120p
2SA-550	150p
2SA-562	50p
2SA-603	100p
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2SA-608	15p
2SA-634	50p
2SA-636	50p
2SA-640	60p
2SA-673	20p
2SA-684	60p
2SA-699	100p
2SA-708	300p
2SA-715	80p
2SA-720	20p
2SA-725	80p
2SA-726	25p
2SA-733	30p
2SA-747A	600p
2SA-798	55p
2SA-748	90p
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2SD-358	40p
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2SD-380	650p
2SD-381	80p
2SD-388	170p
2SD-389	90p
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2SD-401	50p
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2SD-555	500p
2SD-560	150p
2SD-571	80p
2SD-575	530p
2SD-600	80p
2SD-601	40p
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2SD-612	100p
2SD-613	70p
2SD-636	30p
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2SD-640	350p
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2SD-777	400p
2SD-784	650p
2SD-786	100p
2SD-787	100p
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2SD-821	550p
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2SD-850	260p
2SD-856	80p
2SD-858	250p
2SD-863	80p
2SD-864	200p
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2SD-866A	140p
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2SD-870	400p
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2SD-882	80p
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2SD-894	120p
2SD-895	200p
2SD-896	200p
2SD-900	400p
2SD-905	600p
2SD-916	130p
2SD-917	300p
2SD-921	320p
2SD-923	360p
2SD-946	120p
2SD-947	100p
2SD-950	300p
2SD-951	350p
2SD-957A	520p
2SD-958	60p
2SD-965	100p
2SD-970	170p
2SD-973	60p
2SD-973A	70p
2SD-985	120p
2SD-986	120p
2SD-1012	120p
2SD-1021	120p
2SD-1022	400p
2SD-1024	130p
2SD-1031	130p
2SD-1046	200p
2SD-1051	130p
2SD-1060	130p
2SD-1064	250p
2SD-1071	450p
2SD-1073	350p
2SD-1094	520p
2SD-1111	60p
2SD-1128	200p
2SD-1135	150p
2SD-1138	80p
2SD-1159	90p
2SD-1160	150p
2SD-1163A	220p
2SD-1164	120p
2SD-1168	425p
2SD-1169	280p
2SD-1185	400p
2SD-1186	400p
2SD-1189	125p
2SD-1190	150p
2SD-1196	150p
2SD-1207	50p
2SD-1210	280p
2SD-1211	120p
2SD-1225	120p
2SD-1229	250p
2SD-1237	300p
2SD-1248	270p
2SD-1251	180p
2SD-1266	180p
2SD-1272	200p
2SD-1273	100p
2SD-1275	160p
2SD-1276	200p
2SD-1277	190p
2SD-1279	600p
2SD-1289	300p
2SD-1291	400p
2SD-1292	60p
2SD-1297	425p
2SD-1308	140p
2SD-1309	140p
2SD-1310	140p
2SD-1326	200p
2SD-1328	60p
2SD-1347	70p
2SD-1348	85p
2SD-1350	150p
2SD-1376	125p
2SD-1379	100p
2SD-1380	100p
2SD-1383	100p
2SD-1390	350p
2SD-1391	450p
2SD-1392	150p
2SD-1395	150p
2SD-1396	240p
2SD-1397	250p
2SD-1398	210p
2SD-1399	300p
2SD-1400	280p
2SD-1402	280p
2SD-1406	120p
2SD-1407	160p
2SD-1409	190p
2SD-1415	190p
2SD-1425	430p
2SD-1426	350p
2SD-1427	380p
2SD-1428	450p
2SD-1429	410p
2SD-1430	280p
2SD-1431	400p
2SD-1432	600p
2SD-1433	750p
2SD-1438	140p
2SD-1439	320p
2SD-1441	440p
2SD-1448	140p
2SD-1450	60p
2SD-1451	260p
2SD-1453	170p
2SD-1455	320p
2SD-1457	220p
2SD-1459	120p
2SD-1468	60p
2SD-1496	450p
2SD-1497	450p
2SD-1505	120p
2SD-1554	500p
2SD-1555	450p
2SD-1576	450p
2SD-1577	480p
2SD-1579	120p
2SD-1591	310p
2SD-1595	160p
2SD-1604	200p

2SD-1667	120p	2SK-55	100p
2SD-1668	120p	2SK-68	100p
2SD-1677	300p	2SK-134	415p
2SD-1739	450p	2SK-135	415p
2SD-1783	100p	2SK-147	160p
2SD-1815	100p	2SK-192	45p
2SD-1825	120p	2SK-195	150p
2SD-1843	100p	2SK-197	140p
2SD-1846	350p	2SK-312	750p
2SD-1884	300p	2SK-323	130p
2SD-1910	280p	3SK-88	70p

BRIDGE RECTIFIERS

W005	1A/50V	16p
WO1	1A/100V	18p
WO2	1A/200V	19p
WO4	1A/400V	21p
WO6	1A/600V	23p
WO8	1A/800V	28p
BR81D	2A/100V	33p
BR82D	2A/200V	33p
BR84D	2A/400V	37p
BR86D	2A/600V	43p
BR88D	2A/800V	43p
BR32	3A/200V	43p
BR34	3A/400V	43p
BR36	3A/600V	44p
BR62	6A/200V	60p
BR64	6A/400V	72p
BR251	25A/100V	150p
BR252	25A/200V	165p
BR254	25A/400V	185p
BR256	25A/600V	200p
BR258	25A/800V	240p
BR351	35A/100V	185p
BR352	35A/200V	200p
BR354	35A/400V	225p
BR356	35A/600V	230p
BR358	35A/800V	260p
BY164	1.5A/100V	40p
BY179	1.5A/800V	40p

TRIACS

TIC206D	— 4A/400V	60p
TIC225D	— 6A/400V	69p
TIC226D	— 8A/400V	68p
TIC236D	— 12A/400V	85p
TIC248D	— 16A/400V	105p
TIC253D	— 20A/400V	190p
TIC263D	— 25A/400V	205p
T2800D	— 8A/400V	52p

THYRISTORS (SCR's)

2N.5061	— 0.8A/60V	20p
2N.5062	— 0.8A/100V	28p
2N.5064	— 0.8A/200V	29p
C106D	4A/400V	28p
TIC116C	8A/300V	59p
TIC116D	8A/400V	70p
TIC116M	8A/600V	79p
TIC126D	12A/400V	75p
TIC126M	12A/600V	90p
2N.4444		76p
BR103		37p
BR303		85p
BT106		180p
BT116		80p
BT119		100p
OT121		120p
TIC44		22p
TIC45		27p
TIC47		32p
17088		200p
17089		200p
17127		200p
15/80H		230p
15/85R		230p
SG613		850p

UHF TUNERS

U322LO	600p
U341	500p
U342	500p

VIDEO LAMPS

UNIVERSAL VIDEO LAMPS 12V.60 mA (300mm WIRES) RED OR BLUE — 30p

VIDEO LAMP FOR PANASONIC — 60p

CASSETTE DC MOTORS

6V	240p
9V	240p
12V CW	240p
12V CCW	240p
13.2V CW	290p
13.2V CCW	290p

CASSETTE TAPE HEADS

MONO HEAD	90p
STEREO HEAD	150p
MINI HEAD	230p
AUTO REVERSE HEAD	260p

UNIVERSAL TRIPLERS	450p
SONY ON/OFF SWITCHES	200p
PHILIPS SWITCHES K30, K35, K40, KT3, KT4	150p

VIDEO HEADS

JVC/AKAI/FERGUSON 3HSS (For all Models) £[illegible]

NATIONAL PANASONIC 4HSS = 3HSSN — £11.50
(NV322, NY332, NV340, NV2000, NV2010, NV7000, NV8170, NV8200, NV8400, NV8600, NV8610, NV8620).

AKAI

VS-109/201/202/301/303 — £24.00

AMSTRAD

VCR 4500, 5200, 9000 VCR 7000 — £18.50

FERGUSON

3V32/JVC HR7655 — £34.50
3V42/44/45/46/47 — £21.00

FISHER

FVHP510/520/530/615/620/622/710/715/720/721/722/910 — £19.00
FISHER VBS 7100/VBS 7500 — £29.00
FISHER VBS 9000/VBS 9900 — £29.00
FISHER VBS 7000 — £30.00

HITACHI

VT11/14/33/61/63 — £17.50
HITACHI VT7-17, VT35-38, VT39 — £36.95
HITACHI VT19 — £38.00
HITACHI VT120, VT 220 — £31.50
HITACHI VT3000 — £14.00
HITACHI VT5000, VT 5500 — £20.00
HITACHI VT65, 7000, 8000, 8300, 8500, 8700, 9300, VT9500, 9700 — £17.50

NATIONAL

NV 777/NV 330	£22.30
NV 430/NV 460	£21.00
NV 730 4 HEAD	£28.50
NV 366 4 HEAD	£28.50
NV 180 PORTABLE 4 HEAD	£41.00
NV 370/NV 380	£18.00
NV 788/NV 810	£43.50
NV 850/NV 870	£50.00
NVG 15	£41.50
NVG 30	£28.00
NVG 33, NVG 45, NVG 46	£41.00
NVG 40, NVG 130	£28.00
NVG 400	£42.00

SANYO

VTC 5000, VTC 5400, VTC 6000, VTC 6500	£28.00
VTCM10/11/20/21/25/30/31/35/40/50 VTC 5100, VTC 5150, VTC 5300	£28.00
VTC 5350/5370, VTCNX 10/15/20/30, VTC 5550	£28.00
VTC 5100, VTC 5150, VTC 5300	£26.50
VTC 9100/9300/9455/9500	£28.80
VTC 9350/9355	£28.80
VTC 5500	£30.50

SHARP

VC 381, VC 383, VC 386, VC 387, VC 388, VC 482, VC 483 — £18.75
VC 486, VC 3300, VC 8381, VC 9100, VC 9300, VC 9500, VC 9700, VC 582, VC 583, VC 651, VC 681, VC 750, VC 781 — £18.75

SONY

DSR-35R (FOR C20, 30, 40 SLF1, SLF1UB, SLF1E) — £19.00
DSR-43R (FOR SLC7 RANGE SL 5000, SL 5100, SL 3000) — £14.95

TOSHIBA

V21/V9600 — £17.80

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VCR PINCHROLLERS

AKAI

VS9300, VS9500, VS9700, VS9800	280p
VS1, VS2, VS3, VS4, VS5, VS6, VS9, VS10	360p

AMSTRAD

VCR4500, VCR4600, VCR4600 Mk2, VCR4700	280p
VCR5200	360p
VCR7000	360p

FERGUSON

3V00, 3V16, 3V22, 3V23	280p
3V29-30, 3V31-32	280p
3V35-36, 3V38-39, 3V42-43, 3V44-45, 3V48,	280p
3V53, 3V54-55, 3V56-57, 3V58-59, 3V64-65, FV10-11, FV12-14	

HITACHI

VT11, VT33	280p
VT61-62, VT63-64, VT65, VT86-88,	280p
VT110-122, VT120-128, VT130-135, VT138-150, VT168,-220 VT5000, VT8000, VT9300, VT9500	280p

JVC

HR3300, HR3330, HR3360, HR3660, HR4100, HR7700	280p
HR7200, HR7330, HR7660, HR7610, HR7650, HR7655	280p
HRD110, HRD111, HRD120, HRD121, HRD140, HRD150	280p
HRD160, HRD225, HRD455, HRD565, HRD725	

MITSUBISHI

HS200, HS300, HS301, HS302, HS303, HS304, HS310,	280p
HS320, HS700	

NATIONAL

NV100, NV180, NV300, NV333, NV340, NV366, NV600,	280p
NV777, NV788	
NV230, NV370, NV430, NV460, NV730, NV810, NV830,	280p
NV850, NV870, NV890, NV2000, NV2010, NV3000, NV7000, NV7200, NV7800, NV8600, NV8610, NV8620, NVG14 NVG7, NVG10, NVG12, NVG18	360p
NVG21, NVG25, NVH65	360p

PHILIPS

VR6460	280p

SANYO

VHR1100, VHR1300, VHR1500, VHR2300	360p
VTC5000, VTC5150, VTC5500, VTC9300, VTCM10, VTCM20	280p

SHARP

VC381, VC386, VC2300, VC3300, VC7300, VC7700, VC8300	360p
VC9100, VC9300, VC9500, VC9700 VC387, VC481, VC482, VC483, VC486, VC496, VC581	360p
VC582, VC583, VC585 VC651, VC681, VC685, VC750, VC780, VC781, VC785, VC787	360p
VC793, VCT72	

SONY

SLC5, SLC6, SLC7	360p
SLC9, SLC20, SLC24, SLC30, SLC33, SLC44, SLHF100	360p
SLF1, SLF11, SLF25, SLF30, SLF60, SLF100	

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★ 75 OHM COX CABLE WITH ★
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★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

VCR BELT KITS

AKAI

VP-7100	160p
VS-1	150p
VS-2EG	100p
VS-4	120p
VS-5EG	100p
VS-9300	160p
VS-9500	155p
VS-9700	160p
VS-9800	155p

AMSTRAD

TVR-1-2-3	210p
VCR-4600 & Mk 2	210p
VCR-4700	210p
VCR-5200	210p
VCR-7000	80p

FERGUSON

3292, 3V00, 3V01	150p
3V16, 3V22, 3V23	65p
3V29/30	120p
3V31/32	85p
3V35/36	80p
3V38-39	80p
3V42/43	65p
3V44/45	65p
3V45/54	65p
3V55	65p

FISHER

VBS-7000	245p
VBS-9000	120p

HITACHI

VT-11, VT-33	100p
VT-5000	120p
VT-5500	130p
VT-8000	60p
VT-8500	60p
VT-9300	50p
VT-9500	50p
VT-9700	60p

JVC

HR-3300, HR-3330, HR-3360, HR-3660,	150p
HR-4100	180p
HR-7200	70p
HR-7600	80p
HR-7610	95p
HR-7650	75p
HR-7655	90p
HR-7700	77p
HRD-110, HRD-111, HRD-120, HRD-225	100p
HRD-250, HRD-455, HRD-565, HRD-566, HRD-725, HRD-755	100p

MITSHUBISHI

HS-200	200p

NATIONAL

NV-300	160p
NV-333	135p
NV-777	100p
NV-2000	150p
NV-3000	160p
NV-7000	95p
NV-7200	90p
NV-8600	160p

PHILIPS

VR-6460	170p

SANYO

VTC-5000	75p
VTC-5300	100p
VTC-5500	95p
VTC-9300	220p

SHARP

VC-381/383/386	125p
VC-6300	150p
VC-7300/7700/7750	150p
VC-8300	150p
VC-8381, VC-9100	125p
VC-9300, VC-9500	135p

SONY

SL-C5, SL-C6	140p
SC-C7	140p
SC-C9	165p
SL-8000-8080	200p

TOSHIBA

V-55/57	85p
V-5250/5280	230p
V-5480	210p
V-5475	160p
V-7540	160p
V-8600	150p
V-9600	85p

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VIDEO MOTORS

AMSTRAD

VCR-7000 REEL MOTOR	1700p

FERGUSON & JVC

CAPSTAN MOTOR PU-45979	2100p
CAPSTAN MOTOR PU-55371V	1950p
DRUM MOTOR PU-46414	1950p
REEL MOTOR PU-51381V	2650p

NATIONAL

REEL MOTOR MYN-135V5L FOR NV333, NV366	1350p

SANYO

REEL MOTOR 4-529V-10800	700p

SHARP

REEL MOTOR RMTOV 1008 GEZZ	1500p

SONY

CAPSTAN MOTOR A-6751131A FOR SLC6	700p
CAPSTAN MOTOR BHF 1100D FOR SLC7	2500p

VIDEO LAMPS

VIDEO LAMPS UNIVERSAL 12V60mA (300mm WIRES)	30p
PANASONIC VIDEO LAMPS	60p

IDLERS & PULLEYS REPLACEMENTS

HITACHI

FF REW IDLER 6886971	190p
PLAY IDLER V-6861482	320p

JVC

IDLER ASSEMBLY PU-47752	450p
TAKE UP IDLER PU-51402A	145p
TAKE CLUTCH PU-55373	225p
IDLER ARM PU-55373-3-8	285p
FAST FORWARD IDLER PU-45896C	210p

NATIONAL

IDLER	200p

SANYO

REEL PULLEY 143-0-662T-01201	520p

SHARP

IDLER NIDL0005 GEEZ	195p
IDLER NIDL0006 GEEZ	195p

SONY

REW. PULLEY A-6706-348-B	400p
REW. PULLEY A-6706-391-A/B	300p

SERVICE AIDS

SERVISOL PRODUCTS

V. HEAD CLEANER	100p
SWITCH CLEANER	115p
SILICONE GREASE	135p
FREEZE IT	125p
FOAM CLEANER	120p
ANTI-STATIC	120p
AEROKLEANE	100p
AERO DUSTER	125p
PLASTIC SEAL	115p

If you purchase more than one Servisol product postage will be £2.00

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★ **UNIVERSAL** ★
★ **TRIPLERS** ★
★ **450p** ★
★ ★ ★ ★ ★ ★ ★ ★ ★

★ ★ ★ ★ ★ ★ ★ ★ ★
★ **SONY ON/OFF** ★
★ **SWITCHES** ★
★ **200p** ★
★ ★ ★ ★ ★ ★ ★ ★ ★

★ ★ ★ ★ ★ ★ ★ ★ ★
★ **PHILIPS** ★
★ **SWITCHES** ★
★ **150p** ★
★K30, K35, K40, KT3, KT4★
★ ★ ★ ★ ★ ★ ★ ★ ★

4000B SERIES CMOS IC's

4000	13p
4001	13p
4002	13p
4006	34p
4007	13p
4008	38p
4009	20p
4010	21p
4011	13p
4012	13p
4013	19p
4014	32p
4016	18p
4017	29p
4018	30p
4019	28p
4020	33p
4021	36p
4022	36p
4023	13p
4024	25p
4025	13p
4026	60p
4027	18p
4028	29p
4029	34p
4030	17p
4031	90p
4032	52p
4033	60p
4034	76p
4035	42p
4036	180p
4037	75p
4038	46p
4039	180p
4040	30p
4041	36p
4042	30p
4043	36p
4044	36p
4045	72p
4046	42p
4047	45p
4048	27p
4049	18p
4050	20p
4051	38p
4052	35p
4053	35p
4054	53p
4055	52p
4056	52p
4060	40p
4063	52p
4066	20p
4067	120p
4068	13p
4069	13p
4070	13p
4071	13p
4072	13p
4073	13p
4075	13p
4076	42p
4077	13p
4078	13p
4081	13p
4082	13p
4085	36p
4086	30p
4089	75p
4093	18p
4094	44p
4095	58p
4098	50p
4099	42p
4501	27p
4502	36p
4503	30p
4504	55p
4505	180p
4506	58p
4507	30p
4508	67p
4510	32p
4511	30p
4512	38p
4513	80p
4514	65p
4515	65p
4516	36p
4517	100p
4518	36p
4519	28p
4520	36p
4521	86p
4522	43p
4526	38p
4527	41p
4528	38p
4529	65p
4532	48p
4551	75p
4553	140p
4555	29p
4556	36p
4557	140p
4583	60p
4584	30p
4585	40p
40100	120p
40101	78p
40102	150p
40103	120p
40104	80p
40105	140p
40106	35p
40107	50p
40108	260p
40109	74p
40110	170p
40114	180p
40117	180p
40147	240p
40160	55p
40161	55p
40162	65p
40163	55p
40174	48p
40175	60p
40181	170p
40182	70p
40192	48p
40193	48p
40194	58p
40208	240p
40257	120p

74 SERIES

7400	20p
7401	16p
7402	18p
7403	20p
7404	35p
7405	10p
7406	36p
7407	36p
7408	25p
7409	20p
7413	30p
7414	45p
7416	40p
7417	32p
7420	22p
7421	25p
7425	15p
7430	25p
7437	28p
7438	32p
7442	38p
7447	60p
7450	22p
7451	10p
7454	25p
7470	30p
7473	25p
7474	35p
7475	25p
7481	90p
7482	60p
7485	28p
7486	28p
7489	75p
7490	35p
7492	45p
7493	35p
7495	48p
7497	80p
74107	30p
74111	52p
74116	85p
74119	85p
74122	40p
74123	20p
74125	40p
74126	45p
74132	42p
74141	55p
74145	70p
74153	45p
74155	45p
74157	45p
74160	50p
74164	50p
74167	35p
74173	50p
74174	60p
74175	65p
74176	45p
74180	50p
74182	45p
74192	40p
74196	40p
74197	45p
74393	70p

74HC SERIES HIGH SPEED CMOS

74HC00	14p
74HC02	14p
74HC03	14p
74HC04	15p
74HC08	18p
74HC10	20p
74HC11	14p
74HC14	26p
74HC20	19p
74HC21	20p
74HC27	20p
74HC30	20p
74HC32	20p
74HC42	30p
74HC51	20p
74HC73	24p
74HC74	24p
74HC75	28p
74HC76	28p
74HC77	35p
74HC85	33p
74HC86	29p
74HC93	50p
74HC107	28p
74HC109	28p
74HC112	28p
74HC113	28p
74HC123	35p
74HC125	32p
74HC126	33p
74HC131	36p
74HC132	33p
74HC133	33p
74HC137	52p
74HC138	33p
74HC139	22p
74HC147	42p
74HC148	38p
74HC151	32p
74HC153	32p
74HC154	90p
74HC155	48p
74HC157	34p
74HC158	34p
74HC160	44p
74HC161	44p
74HC162	44p
74HC163	44p
74HC164	44p
74HC165	56p
74HC166	60p
74HC173	52p
74HC174	38p
74HC175	38p
74HC181	180p
74HC182	60p
74HC190	46p
74HC191	65p
74HC192	53p
74HC193	41p
74HC194	46p
74HC195	46p
74HC221	80p
74HC237	50p
74HC238	55p
74HC240	48p
74HC241	47p
74HC242	55p
74HC243	60p
74HC244	44p
74HC245	48p

74HC251	25p
74HC253	36p
74HC257	40p
74HC258	50p
74HC259	52p
74HC273	42p
74HC279	35p
74HC280	61p
74HC283	61p
74HC298	50p
74HC299	105p
74HC354	38p
74HC356	48p
74HC365	34p
74HC366	36p
74HC367	36p
74HC368	36p
74HC373	46p
74HC374	48p
74HC375	52p
74HC377	52p
74HC386	20p
74HC390	50p
74HC393	47p
74HC423	65p
74HC533	65p
74HC534	61p
74HC540	70p
74HC541	70p
74HC563	60p
74HC564	60p
74HC573	68p
74HC574	65p
74HC583	90p
74HC595	85p
74HC597	80p
74HC620	110p
74HC623	110p
74HC640	90p
74HC643	90p
74HC646	120p
74HC648	120p
74HC651	100p
74HC652	100p
74HC670	75p
74HC688	80p
74HC690	110p
74HC691	110p
74HC4002	25p
74HC4015	85p
74HC4016	75p
74HC4017	48p
74HC4020	50p
74HC4022	40p
74HC4024	34p
74HC4028	40p
74HC4040	34p
74HC4049	38p
74HC4050	38p
74HC4051	85p
74HC4052	85p
74HC4053	85p
74HC4059	85p
74HC4060	33p
74HC4066	33p
74HC4072	31p
74HC4075	28p
74HC4078	32p
74HC4094	50p
74HC4316	100p
74HC4351	110p
74HC4352	160p
74HC4510	120p
74HC4511	70p
74HC4514	120p
74HC4515	120p
74HC4516	125p
74HC4518	55p
74HC4520	60p
74HC4538	75p
74HC4543	75p
74HC7266	75p
74HC22106	580p
74HC40104	190p
74HC40105	250p

74LS SERIES LOW POWER SCHOTTKY T.T.L

74LS00	12p
74LS01	12p
74LS02	12p
74LS03	12p
74LS04	12p
74LS06	12p
74LS08	12p
74LS09	14p
74LS10	12p
74LS11	12p
74LS12	12p
74LS13	20p
74LS14	24p
74LS15	14p
74LS20	14p
74LS21	14p
74LS22	14p
74LS24	35p
74LS26	14p
74LS27	14p
74LS28	14p
74LS30	14p
74LS32	15p
74LS33	15p
74LS31	15p
74LS38	15p
74LS40	15p
74LS42	25p
74LS47	52p
74LS48	48p
74LS51	13p
74LS54	13p
74LS55	15p
74LS73	24p
74LS74	18p
74LS75	24p
74LS76	24p
74LS78	24p
74LS83	37p
74LS85	37p
74LS86	25p
74LS90	26p
74LS91	55p
74LS92	32p
74LS93	26p
74LS95	41p
74LS96	52p
74LS107	28p
74LS109	28p
74LS112	28p
74LS113	28p
74LS114	28p
74LS122	35p
74LS123	35p
74LS124	85p
74LS125	30p
74LS126	30p
74LS132	30p
74LS133	30p
74LS136	30p
74LS138	28p
74LS139	28p
74LS145	65p
74LS147	90p
74LS148	75p
74LS151	27p
74LS153	31p
74LS154	78p
74LS155	36p
74LS156	36p
74LS157	22p
74LS158	27p
74LS160	38p
74LS161	38p
74LS162	38p
74LS163	36p
74LS164	36p
74LS165	50p
74LS166	65p
74LS168	60p
74LS169	55p
74LS170	68p
74LS174	30p
74LS175	32p
74LS190	47p
74LS191	43p
74LS192	41p
74LS193	41p
74LS194	41p
74LS195	44p
74LS196	45p
74LS197	42p
74LS221	45p
74LS240	45p
74LS241	42p
74LS242	43p
74LS243	50p
74LS244	40p
74LS245	40p
74LS247	40p
74LS248	40p
74LS249	70p
74LS251	24p
74LS253	36p
74LS256	52p
74LS257	32p
74LS258	35p
74LS259	50p
74LS260	30p
74LS266	22p
74LS273	44p
74LS279	33p
74LS280	88p
74LS283	51p
74LS290	26p
74LS293	26p
74LS365	26p
74LS366	31p
74LS367	28p
74LS368	30p
74LS373	45p
74LS374	45p
74LS375	46p
74LS390	42p
74LS393	37p
74LS399	68p
74LS629	96p
74LS641	88p
74LS642	105p
74LS644	105p
74LS645	105p
74LS670	62p
74LS674	310p
74LS687	250p

COMPUTER IC'S

2114	200p
2532	330p
2716	200p
2732	280p
2732A	300p
2764	240p
27C64	550p
27128	350p
26256-25	400p
41256-12	450p
256DRAM	450p
4116	75p
4164	150p
6116	180p
6264	400p
6502	300p
6502A	400p
65C02	930p
6503	570p
6520	170p
6522	330p
6530	1050p
6532	460p
6545	880p
6551	530p
6800	210p
6802	220p
6803	800p
6808	500p
6809	600p
6810	150p
6818	380p
6820	140p
6821	140p
6840	310p
6845	620p
6850	110p
8080A	400p
8085A	300p
8086	500p
8088	500p
8155	360p
8156	360p
81LS95	120p
81LS96	130p
81LS97	130p
81LS98	130p
8224	240p
8226	240p
8228	270p
8243	250p
8250	850p
8087	11000p
8251	270p
8253	230p
8255	200p
8256	1200p
8257	220p
8259	280p
8271	3400p
8272	1200p
8279	270p
8282	300p
8283	400p
8284	440p
8287	360p
8288	650p
8748	1100p
8755	1400p
AY3-1015	290p
SP0256AL2	500p
Z80ACPU	150p
Z80BCPU	400p
Z80ADMA	500p
Z80AP10	220p
Z80BP10	340p
Z80AGTC	200p
Z80BCTC	320p
Z80AS10	460p
Z80AS10-1	580p
Z80BP10-2	580p
Z80ADART	500p
74S289	180p
74S387	200p
75107	65p
75110	75p
75113	100p
75122	110p
75150	95p
75154	100p
75162	700p
75182	95p
75183	95p
75188	55p
75189	55p
75195	185p
75451	40p
75454	65p
75492	55p
8T26	95p
8T28	110p

OPTO COUPLERS

4N25	50p
4N26	50p
4N27	50p
4N28	50p
4N29	50p
4N30	90p
4N31	90p
4N32	100p
4N33	100p
4N36	58p
4N37	58p
4N38	58p

LED DISPLAYS

MAN.72	115p
MAN.74	115p
MAN.4640	180p
MAN.8910	230p
DL.747	160p

SOLDERING IRON

ANTEX XS25W 240V Soldering Iron 240Vac	540p
Spare Element for XS25W 240V	260p
ANTEX C15W 240V Soldering Iron 240Vcm	540p
Spare Element for C15W 240V	260p

DESOLDERING PUMP
SOLDERING IRON

ANTEX XS25W 240V Soldering Iron 240Vac	540p
Spare Element for XS25W 240V	260p
ANTEX C15W 240V Soldering Iron 240Vcm	540p
Spare Element for C15W 240V	260p

DESOLDERING PUMP

Desolder Pump	290p
Spare Nozzle	60p

SOLDER MOP	65p

SOLDER

18 SWG	500g	500p
20 SWG	500g	650p

SOLDERING IRON STAND

Soldering Stand	200p
Spare Sponge	40p

FLOPPY DISCS

5¼ inch DSDD (10 In box) Branded Name	£7.50
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We need expiry dates for credit card orders.
MINIMUM ORDER £5.

VIDEO SPARES

BELT KITS

		no of belts	
VK1	AKAI VS9300/9500/9000 JVC HR3300/3320/3330/3360 TCE 8903/3V00/3V16/3V22	7	2.40
VK2	NAT.PAN. NV7000B/7200B	5	1.45
VK3	SONY SLC5/7	6	2.25
VK4	SONY SL8000/8500/8600	6	3.60
VK5	SONY SL3000UB	7	2.10
VK6	NAT. PAN. NV3000B	6	1.99
VK7	SANYO 9300P	4	2.75
VK8	NAT. PAN. NV2000B	6	1.73
VK9	NAT. PAN. NV8600B/8610/V011	7	1.50
VK10	TOSHIBA V8600	6	1.45
VK13	SANYO VTC5000	2	1.50
VK14	SANYO VTC5300	5	1.85
VK15	JVC HR7650/3V31	3	2.00
VK16	HITACHI 5000		1.90
VK17	SHARP 8300	6	1.76
VK18	SHARP 9300	5	1.47
VK19	HITACHI VT8000/8300/8500	3	1.05
VK20	HITACHI VT11/33	6	1.50
VK21	HITACHI 9500	3	1.12
VK22	SONY SLC6	6	1.90
VK23	SANYO 5500	3	1.05
VK24	NAT. PAN. NV300/NV333	6	1.55
VK25	TOSHIBA V7540	5	1.90
VK26	JVC/HR 7700/3V23	2	0.95
VK27	THORN 3V29	4	1.75
VK28	AMSTRAD 7000	3	1.45
VK38	AMSTRAD 4500/9000		3.25
VK39	AMSTRAD 4600/5200		2.95
VK29	NAT. PAN. NU777	4	1.80
VK30	SONY T9	6	2.20
VK31	TOSHIBA 9600	4	1.20
VK32	SANYO 1100-1300-1500		0.75
VK33	FERGUSON 3V35-36		0.85
VK34	FERGUSON 3V42-3-4-5-8		0.90
VK35	FISHER FVHP710-716-722		1.20
VK36	PANASONIC NV370-430		1.20
VK37	HITACHI 9300		0.85

PINCH ROLLERS

AMSTRAD 4500/4600/5200/9000	3.75
AMSTRAD 7000	3.75
NAT. PAN. NV7000	3.75
FERGUSON 3V35	3.75
SANYO VTC9300/VBS7000	3.75
SONY C7/J7/SL17	3.75
JVC TCE3V00/01/06/16	3.75
JVC 23/24	3.75
JVC HR2200/3320/3330/3V22	3.75
JVC 3660/1100/7700	3.75
AKAI VS9700	3.75
HITACHI VT5000	3.75
SHARP VC6300/6500	3.75
SONY T.C. GENERAL	3.75

VIDEO CARE

UNIVERSAL COPYING KIT	7.50
HEAD CLEANER	0.96
BETA ECCENTRICITY GAUGE	57.92
CHAMOIS CLEANING STICKS	0.25

FULL RANGE OF SPECIFIC PARTS FOR NAT.PAN. PHILIPS FIDELITY GEC HITACHI **ALSO** SINCLAIR SONY SANYO

VIDEO LAMPS

NAT. PAN. VHS BULB (ALSO SHARP)	1.30
GENERAL PURPOSE VHS BULB	0.50
3V23 WITH PLUG	1.59
3V29 WITH PLUG	1.59
AMSTRAD 7000	0.45
AMSTRAD 4500/4600/5200/9000	1.80
HITACHI 9300/9500	0.65

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VT4000/4200
5000/5500
VIDEO HEADS

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MOTORS

VHS DRUM MOTOR	25.50
VHS CAPSTAN MOTOR	25.50
SANYO 500 REEL MOTOR	12.95
SHARP REEL MOTOR	19.50

FERGUSON VIDEO SPARES

VCR3V29/30

BOOSTER	01X0-010-088	30.00
CAPSTAN BELT	01X0-033-018	1.75
CAPSTAN MOTOR	01X0-040-014	33.00
CASSETTE HOUSING	01X0-040-030	21.00
CASSETTE LAMP	01X0-040-008	1.59
CASSETTE LAMP HOLDER	01X0-033-417	0.90
COUNTER PULLEY	01X0-040-197	0.50
LOADING BELT	01X0-040-006	0.60
LOADING MOTOR	01X0-034-059	12.02
PINCH ROLLER ASSEMBLY	01X0-040-015	7.21
REEL MOTOR	01X0-040-017	27.35
RF CONVERTER	01X0-040-003	67.09
TAKE UP CLUTCH ASSEMBLY	01X0-042-013	2.00
TAKE UP CLUTCH BELT	01X0-040-023	0.23
TAKE UP SPL.IDLER ASSY	01X0-040-007	2.13
UPPER DRUM ASSEMBLY	01X0-040-002	45.00
TAKE UP IDLER	01X0-040-019	1.44
TENSION BANDS		1.65

VCR3V31

CASSETTE LAMP	01X0-041-142	1.54

VCR3V32

BOOSTER	01X0-042-089	24.89

VCR 3V35/36/38/39

CAPSTAN BELT	01X0-066-014	1.20
CAPSTAN MOTOR	01X0-065-009	26.44
CASSETTE HOUSING ASSY	01X0-065-016	26.63
CASSETTE MOTOR	01X0-065-003	5.64
LOADING BELT	01X0-065-005	0.45
LOWER DOOR SPRING	01X0-065-110	0.16
RF CONVERTER	01X0-065-281	25.50
SPOOL CARRIER IDLER	01X0-066-089	2.55
TAKE UP CLUTCH BELT	01X0-066-013	2.06
TAPE SPOOL DR. BELT	01X0-065-014	0.59
UHF TUNER	01X0-065-075	24.20
LOWER DOOR FLAP	01X0-065-424	2.58
UPPER DOOR FLAP	01X0-083-117	0.95

VCR3V44/5

CASSETTE HOUSING ASSY	01X0-083-069	26.25
VIDEO HEAD ASSEMBLY		55.00

TAKE UP IDLERS ASSY

AKAI MI32773	5.63
AKAI BV327815	4.87
AMSTRAD 7000	2.20
VHS gen THORN/JVC	4.95
FISHER 490400900	3.95
FISHER 420400300/400	4.50
FERG 3292 F/F	1.46
FERG 3V00 F/F	1.46
FERG 3V00 TAKEUP	4.95
FERG 3V00 TAKEUP late	5.85
FERG 3V16 TAKEUP	4.95
FERG 3V16 TAKEUP late	5.85
FERG 3V22 TAKEUP	4.95
FERG 3V22 TAKEUP late	5.85
FERG 3V29 TAKEUP CL	2.08
FERG 3V29 TAKEUP SPL	2.13
FERG 3V29 TAKEUP IDL	1.44
HITACHI F/F 6886971	2.90
HITACHI 6413663	2.68
HITACHI 6414221	5.04
HITACHI 6383531	0.70
HITACHI 6861471	2.43
HITACHI 6861482	5.02
HITACHI 6345173	0.40
HITACHI 6886971	2.90
NAT PAN VXP0463	3.20
NAT PAN VXP0243	1.10
NAT PAN VXP0401	1.08
NAT PAN VXP0344	1.22
NAT PAN VXP0331	1.28
NAT PAN VXP0521	4.08
NAT PAN VXP0433	5.50
SANYO RELL DRIVE PUL	5.10
SANYO 5000 RLR ASSY	1.85
SHARP 0005	2.20
SHARP 006	2.20
SONY SLC5 7 3000	1.27

TRANSISTORS

BC337	0.18
BD131	0.33
BD235	0.60
BU208A	0.95
BU208D	2.20
BU326A	0.85
BU426	1.60
BUT11	2.58
BUT11AF	3.00

FULL RANGE IN CATALOGUE

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AMSTRAD

T.V./VIDEO – TVR-1-MD1511910	15.00
C.T.V. 1409 – MD1409221	15.00
V.C.R. 5200 – MD151175	17.00
V.C.R. 7000 – MD150583	10.00
V.C.R. 9000 – MD150878	10.00

DECCA

00/100 NON-TXT US8511	19.50
101 SERIES NON-TXT US8513	23.50
TATUNG 145/150	17.50
IR9057 TATUNG RC31	22.50

FIDELITY

C.T.V. 20R/22R/140R 4 BUTTON IR8876	13.75
I.S. 500 12 BUTTON FD09820	13.81
F14R 12 BUTTON FD09156	13.81
A.V.S.14 BUTTON FD09111	13.75
TXT 32 BUTTON IR8983	15.90

G.E.C.

4001/HIT 9300	13.40
GC56520831/C1404H-C1658H-IR8314	31.80
GCA 512220/C1653	22.00
GCA 512230/C2086H-C2087H	
GCA 514620/C2089H-C2090H-IR8823 C2290H C2889	23.50
GCA 510710/C2067H-IR8456	23.50
GCA 510870/C2069-C2269H-IR8877	27.50

GRUNDIG

RTP05/VRC IR138 – TP8-120-120E	13.50
RTP06/IR107N – TP160-160E	13.50
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RTP400/401 IR401 – TP400VT-500VT	13.50
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IR 8613 TXT. – TP400TT	13.50

GRANADA UNIVERSAL IR8450	16.50

I.T.T.

C.V.C. 32 – RG15-US8573	25.00
C.V.C.45 – RG5-US8262	25.00
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R.G. 306 – WITH FINE TUNE IR8650	22.65

J.V.C.

TP 843 TXT IR170	13.50

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REDIFUSION MK 4 TEXT IR8838	16.95

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SLC5 – RM 75T	29.04
SLC7 – RMT 200	49.97
SLC9 – RMT 213	45.00

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G11 TXT U.S. 31 BUTTON 691-17181	29.42
G11 NON TXT U.S. 8263	16.50
G11 2 FUNCTION U.S. 8510	16.50
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KT3/K30 TXT IR8420	16.50
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Type	Order Type
T651	M739
T652	M738
T653	M737
T716	M737
T717	M737
T718	US8517
T719	M737
T720	M739
T721	M737
T723	M737
T724	M739
T725	M750
T731	M738
T732	M739
T733	M738
T734	M734
T736	M739
T737	M737
T738	M738
T739	M739
T740	M740
T742	M742
T748	M748
T750	M750
T769	M739
T770	M739
T772	M742
T773	M740
T775	M739
T778	M738

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SAKURA STEREO SYSTEM	229.00
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AND A COMPLETE RANGE OF AERIALS AND ACCESSORIES ON PAGE 23 IN CATALOGUE

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CM5188 IF Interim Dist Pump	57.00
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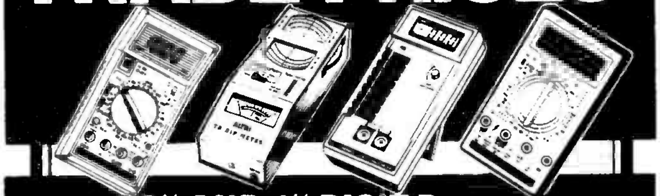

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BD42	5	13A rocker switch three tag so on/off, or change over with centre off
BD45	1	24hr time switch, ex-Electricity Board, automatically adjust for lengthening and shortening day.
BD49	5	neon valves, with series resistors, these make good night lights
BD56	1	mini uniselector, one use is for an electric jigsaw puzzel, we give circuit diagram for this. One pulse into motor, moves switch through one pole
BD59	2	flat solenoids – you could make your multi-tester read AC amps with this
BD67	1	suck or blow operated pressure switch, or it can be operated by any low pressure variations such as water level in water tanks
BD103A	1	6v 750MA power supply, nicely cased with input and output leads
BD120	2	stripper boards each contains a 400v 2A bridge rectifier and 14 other diodes and rectifiers as well as dozens of condensers etc
BD128	10	very fine drills for p.c.b. boards etc. Normal cost about 80p each
BD132	2	plastic boxes approx. 3" cube with square hole through top so ideal for interrupted beam switch
BD134	10	motors for model aeroplanes, spin to start so needs no switch
BD139	6	microphone inserts – magnetic 490 ohm also act as speakers
BD148	4	reed relay kits you get 16 reed switches and 4 coil sets with notes on making c/o relays and other gadgets
BD149	6	safety cover for 13A msockets – prevent those inquisitive little fingers getting nasty shocks
BD180	6	neon indicators in panel mounting holders with lens
BD193	6	5 amp 3 pin flush mounting sockets makes a low cost disco panel – need cable clips
BD196	1	in flex simmerstat – keeps your soldering iron etc always at the ready
BD199	1	mains solenoid very powerful has 1" pull or could push if modified
BD201	8	keyboard switches – made for computers but have many other applications
BD211	1	electric clock mains operated put this in a box and you need never be late
BD221	5	12v alarms make a noise about as loud as a car horn. Slightly soild but OK
BD242	2	6" × 4" speakers 4 ohm made from Radiomobile so very good quality
BD252	1	panostat, controls output of boiling ring from simmer to boil
BD259	50	leads with push on ¼" tags – a must for hook ups – mains connections etc
BD263	2	oblong push switches for bell or chimes, these can mains up to 5 amps so could be foot switch if fitted into pattress
BD268	1	mini 1 watt amp for record player. Will also change speed of record player motor
BD283	3	mild steel boxes approximately 3" × 3" × 1" deep – standard electrical
BD293	50	mixed silicon diodes
BD305	1	tubular dynamic mic with optional table rest
BD667	2	4.7uf, non-polarised block capacitors, pcb mounting
BD400	4	Books. Useful for beginners. Describes amplifiers, test equipment and kit sets
BD653	2	Miniature driver transformers. Ref LT44. 20k to 1k, centre tapped
BD553a	2	3.5 volt operated relays, each with two pairs CO contacts
BD548	2	3.5 volt operated relays, each with two pairs CO contacts

There are over 1,000 items in our Bakers Dozen List. If you want a complete copy please request this when ordering.

EQUIPMENT WALL MOUNT. It is a multi-adjustable metal bracket that could be used for mounting flood light, loud speaker, TV camera, even a fan and on almost any sort of wall or ceiling even between wall and ceiling. The main fixing brackets rotate such that an inward or an outward corner can be accommodated. Front panel also tilts upwards or downwards to a reasonable angle and can be easily removed separately for wiring. A very useful bracket. Regular price would be around £6 each. Our price only £3. Our ref 3P72. Or 2 for £5. Our ref 5P152.

EXTRA SPECIAL CROC CLIPS. Medium size, just right for most hook-ups. Normally sell for around 10p to 15p each. These are insulated and have a length of wire connected to them but this is very easy to snip off if you do not need it. 20 for £1. Our ref BD117A.

COPPER CLAD PANEL for making PCB. Size approx 12in long × 8½in wide. Double-sided on fibreglass middle which is quite thick (about 1/16in) so this would support quite heavy components and could even form a chassis to hold a mains transformer, etc. Price £1 each. Our ref BD683.

FET CAPACITOR MICROPHONE EAGLE C1.200 Output equivalent to a high class dynamic microphone while retaining the characteristics of a capacitor microphone. Price £1. Our ref BD646.

SUB-MAN TOGGLESWITCH Body size 8mm × 4mm × 7mm SBDT with chrome dolly fixing nuts. 3 for £1.00. Order ref BD649.

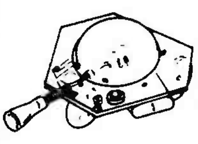
POWERFUL IONISER

Generates approx. 10 times more IONS than the ETI and similar circuits. Will refresh your home, office, shop workroom etc. Makes you feel better and work harder – a complete mains operated kit, case included **£12.50 + £2 P&P.** Our ref 12P5/1.

REAL POWER AMPLIFIER for your car, it has 150 watts output. Frequency response 20hz to 20Khz and signal to noise ratio, better than 60 d/b. Has built in short circuit protection and adjustable input level to suit your existing car stereo, so needs no pre-amp. Works into speakers. Ref. 30P7 described below. A real bargain at only £57.50. Order ref: 57P1.

REAL POWER CAR SPEAKERS. Stereo pair output 100w each. 4-Ohm impedence and consisting of 6½" woofer, 2" mid range and 1" tweeter. Each set in a compact purpose built shelf mounting unit. Ideal to work with the amplifier described above. Price per pair £29.96. Order ref: 30P7.

STEREO CAR SPEAKERS. Not quite so power – 70w per channel. 3" woofer, 2" mid range and 1" diameter. Again, in a super purpose built shelf mounting unit. Price per pair: £27.95. Order ref: 28P1.



ELECTRONIC SPACESHIP. Sound and impact controlled, responds to claps and shouts and reverses when it hits anything. Kit with really detailed instructions. Ideal present for budding young electrician. A youngster should be able to assemble but you may have to help with the soldering of the components on the pcb. Complete kit £8. Our ref 8P30.

12" HIGH RESOLUTION MONITOR. Black and white screen, beautifully cased for free standing, needs only a 12v 1.5 amp supply. Technical data is on its way but we understand these are TTL input. Brand new in maker's cartons. Price: £22.00 Post Free.

14" COLOUR MONITOR made by the American Display Tek company. Uses high resolution tube made by the famous Japanese Toshiba company. Beautifully made unit intended for console mounting, but top and sides adequately covered by plated metal panels. Full technical spec. on its way to us. We have a limited number of these. All brand new still in maker's cartons. Price £89 each plus £6 insured carriage. Order ref: 89P/1.

BUSH RADIO MIDI SPEAKERS. Stereo pair. BASS reflex system, using a full range 4in driver of 4ohms impedance. Mounted in very nicely made black fronted walnut finish cabinets. Cabinet size approx 8½in wide, 14in high and 3½in deep. Fitted with a good length of speaker flex and terminating with a normal audio plug. Price £5 the pair plus £1 post. Our ref 5P141.

3½in FLOPPY DRIVES. We still have two models in stock: Single sided, 80 track, by Chinon. This is in the manufacturers metal case with leads and ICD connectors. Price £40, reference 40P1. Also a double sided, 80 track, by NEC. This is uncased. Price £59.50, reference 60P2. Both are brand new. Insured delivery £3 on each or both.

ATARI 65XE COMPUTER At 64K this is most powerful and suitable for home and business. Brand new, complete with PSU, TV lead, owner's manual and six games. Can be yours for only **£45 plus £3 insured delivery.**

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65XE COMPENDIUM. Contains 65XE Computer, its data recorder XC12 and its joystick with ten games, for £62.50 plus £4 insured delivery.

ASTEC PSU. Mains operated switch mode, so very compact. Outputs: +12v 2.5A, +5v 6A, ±5v .5A, ±12v .5A. Size 7¼in long × 4⅜in wide × 2¾in high. Cased ready for use. Brand new. Normal price £30+, our price only £12.95. Our ref 13P2.

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This is helium-neon and has a power rating of 2mW. Completely safe so long as you do not look directly into the beam when eye damage could result. Brand new, full spec, £30 plus £3 insured delivery. Mains operated power supply for this tube gives 8kv striking and 1.25kv at 5mA running. Complete kit with case £15, ditto for 12v battery. Also £15. Our ref 15p22.

ORGAN MASTER. Is a three octave musical keyboard. It is beautifully made, has full size (piano size) keys, has gold plated contacts and is complete with ribbon cable and edge connector. Can be used with many computers, request information sheet. Brand new, only £15 plus £3 postage. Our ref 15P15.

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HIGH RESOLUTION MONITOR. 9in black and white, uses Philips tube M24/306W. Made up in a lacquered frame and has open sides. Made for use with OPD computer but suitable for most others. Brand new, **£16 plus £5 post.** Our reference 16P1.

12 VOLT BRUSHLESS FAN. Japanese made. The popular square shape (4½in × 4½in × 1¾in). The electronically run fans not only consume very little current but also they do not cause interference as the brush type motors do. Ideal for cooling computers, etc., or for a caravan. **£8 each.** Our ref 8P26.

MINI MONO AMP. on p.c.b. size 4" × 2" (app.) Fitted volume control and ahole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of **£1.15 each of 13 for £12.00**

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TELEPHONE TYPE KEY PAD. Really first class rear mounting unit. White lettering on black buttons. Has conductive rubbers contacts with soft click operation. Circuit arranged in telephone type array. Requires 70mm by 55mm cut out and is connected by 10-pin IDC socket. Price: £2.00 each. Order ref: 2P251.

JOYSTICKS for BBC, Atari, Dragon, Commodore, etc. All £5 each. State which required.

SUB-MIN PUSH SWITCHES. Not much bigger than a plastic transistor but double pole. PCB mounting. Three for £1. Our ref BD688.

NICAD CHARGER UNIT. Metal pronged, plastic case contains mains transformer and rectifiers with output lead and plug – made to charge two cells but no doubt adaptable or wonderful spares value. Only 50p each, two for £1. Our ref DB385.

EDGEWISE PANEL METER. If you are short of panel space then this may be the answer. It has a FSD of 100µA and a nice full vision scale. It fits through a hole approx 1¼in × ½in. Another feature is that it has an indicator lamp behind the scale which you could light up, it would then serve as an on/off indicator. Price £1. Our ref BD700.

AA CELLS. Probably the most popular of the rechargeable NICAD types. 4 for £4. Our ref 4P44.

20WATT 4OOHM SPEAKER. With built-in tweeter. Really well made unit which has the power and the quality for hi-fi reproduction. 6½in diameter. Price £5. Our ref 5P155. It is heavy so please add £1 to cover postage if not collecting.

MINI RADIO MODULE. Only about 2in square with ferrite aerial and solid dia tuner with its own knob. It is a superhet and it operates from PP3 battery and would drive a crystal headphone direct but be better with our mini mono amp. Price £1. Our ref BD716.

BULGIN MAINS PLUG AND SOCKET. The old faithful 3 pin with screw terminals. The socket mounts through a 1½in hole and the mains is brought in by the insulated plug. Used to be quite expensive but you can have 2 pairs for £1 or 4 of either plug or socket for £1. You could make yourself a neat and compact bench panel with these. Our ref BD715, BD715S or BD715P.

MICROPHONE. If you want a low cost microphone then just arrived we have a very small hand-held dynamic mic with on/off switch in the handle. Its lead terminates with one 3.5 plug and the other a 2.5 plug for remote control. Price only £1. Our ref BD711.

EXTENSION CABLE WITH A DIFFERENCE. It is flat on one side making it easy to fix and to look tidy. It is 4 core so suitable for telephone, bell, burglar alarms, etc. 50 yard coil for £5. Our ref 5P153.

MOSFETS FOR POWER AMPLIFIERS AND HIGH CURRENT DEVICES. 140v 100w pair made by the famous Hitachi Company. Reference 25K413 and its compliment 25J118. Only £4 the pair. Our ref 4P42.

BATTERY OPERATED TRAVEL MECHANISM. On a plastic panel measuring approx 9in × 3½in. Is driven by a reversible 12v battery motor, fitted with pulley and belt which rotates a threaded rod and causes a platform to travel backwards and forwards through a distance of approx 5in. Price £5. Our ref 5P140.

MAINS OPERATED WATER VALVE with hose connection for inlet and outlet suitable for low pressure. Auto plant watering, etc. Only £1 each. Our ref BD370.

20 VOLT 4AMP MAINS TRANSFORMER. Upright mounting with fixing feet. Price £3. Our ref 3P59.

16 OHM PM SPEAKERS. Approx 7in × 4in. 5 watts. Offered at a very low price so you can use two in parallel to give you 10 watts at 8 ohms. £1 for the two. Our ref BD684.

EHT TRANSFORMER. 4kv 2mA Ex-unused equipment. £5. Our ref 5P139.

4 CORE TINSEL COPPER LEAD. As fitted to telephones, terminating with flat BT plug. 2 for £1. Our ref BD639.

EHT TRANSFORMER. 8kv 3mA. £10. Our ref 10P56.

VERY USEFUL MAGNETS. Flat, about 1in long, ½in wide and ¼in thick. Very powerful. 6 for £1. Our ref BD274(a).

ACORN COMPUTER DATA RECORDER. Ref ALF03. Made for the Electron or BBC computers but suitable for most others. Complete with mains adaptor, leads and handbook. £10.00. Ref 10P44. Add £2 special packing.

SOLAR CELLS. Will give a good current (depending on size) from sunlight or bright daylight. Module A gives 100mA. Price £1. Our ref BD631. Model C gives 400mA. Price £2. Our ref 2P199. Module D gives 700mA. Price £3. Our ref 3P42.

SOLAR POWERED NI-CAD CHARGER 4 NI-CAD batteries AA (HP7) charged in eight hours or two in only 4 hours. It is complete, boxed ready to use unit. Price £6. Our Ref. 6P3.

METAL PROJECT BOX. Ideal size for battery charger, power supply etc; sprayed grey, size 8" × 4¼" × 4" high, ends are louvered for ventilation other sides are flat and undrilled. Price £3. Order Ref. 3P75.

13A PLUGS. Sleeved and complete with fuse, parcel of 5 for £2. Order Ref. 2P186.

CAPACITOR BARGAIN – axial ended – 4700uf @ 25v Jap made. Normally 50p each, but you will get 4 for £1. Ref. 613.

SINGLE SCREENED FLEX 7.02 copper conductors, pvc insulated then with copper screen, finally outer insulation. In fact quite normal screened flex. 10m for £1. Our ref BO668.

3 CORE FLEX BARGAIN No. 1 – Core size 5mm so ideal for long extension leads carrying up to 5 amps or short leads up to 10 amps. 15mm £2. Ref. 2P189.

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ALPHA-NUMERIC KEYBOARD – this keyboard has 73 keys with contactless capacitance switches giving long trouble free life and no contact bounce. The keys are arranged in two groups, the main area field is a QWERTY array and on the right is a 15 key number pad, board size is approx. 13" × 4" – brand new but offered at only a fraction of its cost namely £3, plus £1 post. Ref. 3P27.

⅛TH HORSEPOWER 12 VOLT MOTOR. Made by Smiths, the body length of this is approximately 3in, the diameter 3in and the spindle 3/16th of an inch diameter. It has a centre flange for fixing or can be fixed from the end by means of 2 nuts. A very powerful little motor which revs at 3,000 rpm. We have a large quantity of them so if you have any projects in mind then you could rely on supplies for at least two years. Price £6. Our ref 6P1, discount for quantities of 10 or more.

TELEVISION

On to the Nineties

As we start upon a new decade I found myself, as long-standing editors tend to do, taking a peek at what I'd written ten years ago, back in 1979. At that time considerable retrenchment was taking place in the West European CTV setmaking industry, with Japanese manufacturers having a growing influence in the UK. Since then of course the indigenous UK setmaking industry has simply faded away. There is still a large manufacturing base in the UK, with exports at record levels, but it's now entirely owned by overseas concerns. CTV sales have waxed and waned during the past decade, with a considerable boom in the late 80s. Right now of course we're in the middle of a classic "stop" phase in the stop-go cycle.

The 80s was the decade when video established itself as a standard part of the domestic scene. At the start of the decade there was still considerable uncertainty about video systems, and the video disc had yet to come and go. By the end of the decade considerable advances had occurred – S-VHS, 8mm video, the camcorder and digital signal processing for example. All at affordable prices. It all goes to show what the Japanese consumer electronics industry can achieve in terms of offering extra value for money.

How long will the present gloom last? Ferguson's spring (1989) Market Report predicted that markets would decline as a result of continuing government efforts to curb consumer spending. 1989 followed the predicted course, with the industry suffering one of its worst years in the decade. The trade balance deteriorated during the year, so the government's clamp down on economic activity has been tightened. But, with an election due in 1992, there is bound to be some relaxation – though probably not until 1991. What a dreary start to the decade! It seems that no lessons in running the economy have been learnt, the same boom and bust pattern persisting. When the upturn does come it's unlikely to be a classic boom, since the TV and video markets in the UK are now mainly replacement ones. We shall have to rely on new products for market growth. This means satellite TV, now perking up after a slow start, more sophisticated VCRs, a further increase in video photography and the prospect of HD-TV towards the end of the decade.

The technology has certainly continued on its course of rapid development. Just a few years ago satellite TV reception was an exotic activity engaged in by a handful of professionals and enthusiasts. Now it's an everyday thing that's come to be accepted as just another of the usual offerings from the industry. There's a steady increase in the number of little dishes to be seen, and installation has turned out to be a relatively routine affair. The digitalisation of TV continues apace now that the chips required have come down in price. Small LCD TV sets are now commonplace, but the c.r.t. looks set to remain the standard device for normal viewing for many years to come.

One can't see the 90s as being a period when fortunes will be made in the consumer electronics field. Satellite TV equipment for example has from the start been offered to viewers at knock-down prices. It's likely to be a tick-over decade, as we wait for the dramatic advance represented by HD-TV.

Query Service Ends

The Query Service has been a feature of this magazine for many years – since March 1951 in fact. In the early days there was a considerable call for it. Those were the days of unreliable sets that many owners could service themselves and the faults were usually easy to diagnose. It was in fact the era of the stock fault. The situation has changed drastically since those days and owner repair is now something of a rarity. There has been a marked decline in the use of our Query Service in recent years, while diagnosis via letters of the ills suffered by modern equipment has become much more difficult. With much of today's video and TV equipment successful fault diagnosis can be achieved only by someone on the spot using sophisticated test equipment. We can guess and give some general guidance about what to look for, but access to stocks of spares, service data and suitable test gear – also very often, especially with video equipment, considerable skill – is usually required to effect repairs successfully. There's also the fact that the range of equipment now encountered, with many sets continuing to work happily for ten to fifteen years or more, is so vast that few people have practical experience of more than a relatively limited range. For all these reasons the Query Service has become steadily less feasible to run and we have reluctantly decided to terminate it.

Although we may continue to include a Service Bureau page for a month or two to publish information on file, we feel that space is better devoted to our TV Fault Finding, VCR Clinic and other servicing features. These provide feedback on actual faults and their remedies rather than guesswork. Those who require a general servicing guide will find that the recently published book "Servicing TV and Video Equipment" by Eugene Trundle is an invaluable reference source. It contains a symptom index to get you rapidly to relevant information. It's published by Heinemann Newnes, Halley Court, Jordan Hill, Oxford OX2 8EJ at £25.

We must thank all those contributors who, over the years, have manned the query service on our behalf.

EDITOR

John A. Reddihough

Please note that the telephone numbers below are for contact with the advertisement departments only. Editorial enquiries should be sent to the editor at the address given on page 177.

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PRICE INCREASE

We regret the need to increase our cover price to £1.60 from the Frebruary issue. Increased production costs have made this rise necessary.

CORRECTIONS

See page 197.

NEW PRODUCT GUIDE

For commercial reasons the CPC New Product Guide last month was not included with copies distributed overseas. We should have made this clear and apologise for any misunderstandings.

COVER PHOTO

This month's cover photograph shows a Panasonic NV2000 with its top and front covers removed. See article on pages 195-7.

Camera Tube Guide

Peter Delaney, B.Sc., G8KZG

Data on TV camera tubes is not readily available. The following list of the main types of vidicon, low-light vidicon (Newvicons and Ultricons) and lead-oxide tubes (Leddicons, Plumbicons and Vistacons) has been compiled to help those who may need to replace a camera tube. The tubes are listed by diameter and grouped by their major characteristics. Within each group the tubes are listed alphanumerically: in general they are interchangeable. Notes at the end identify the more important differences.

In some cases you may find that the type number on a tube has one or more suffix letters. This indicates the grade of tube (broadcast, industrial, amateur) or the channel for which the tube is intended (red, green, blue, luminance). The suffix A is sometimes used for a more important variation and is thus included in the list below.

Except for lead-oxide tubes, which mount as listed, tubes are normally mounted from the front (lens) end of the camera. It's not possible of course to interchange tubes with different focus and/or deflection arrangements.

In case of difficulty an integral mesh tube can be replaced with a separate mesh type of similar specification by wiring G4 and G3 together on the tube base socket. Provided care is taken, it's often possible to use as a replacement a tube with a different heater rating: for example, a tube with a 95mA heater can be used to replace one with a 300mA heater by wiring a 30Ω resistor across the tube socket heater pins.

Striped filter tubes are not listed here as they must usually be replaced with a tube of the same type.

½in Vidicons

(1) Tubes with magnetic focusing and deflection.
9697, 9737, 9738. These tubes have a 90mA heater and separate mesh – the mesh connection is to the ring next to the target connector.

P888. Separate mesh, 150mA heater.

(2) Tube with electrostatic focusing and magnetic deflection.
XQ1600. Separate mesh; 107mA, 2·8V heater.

½in Newvicons/Ultricons

See note (1). The following tubes have electrostatic focusing, magnetic deflection and a separate mesh.
XQ1601. Has a 107mA, 2·8V heater.

XQ1602. Has a 95mA heater and radiation resistant faceplate.

½in Leddicon/Plubicon/Vistacon

P8470.

⅔in Vidicons

(1) Tubes with magnetic focusing and deflection.
E1170, M7075, P8037, TV8800, XQ1271, XQ1310, XQ1311, 20PE13, 20PE13A, 8823, 8844, 9831. Separate mesh, 90mA heater. The **P8215** is a short, 65mm version.

XQ1270. Integral mesh, 110mA heater.

XQ1300, 20PE11. Integral mesh, 90mA heater.

(2) Tubes with electrostatic focusing and magnetic deflection.
E5045, N513, N887, S4097, S4097A, XQ1272, XQ1590, 4848, 8929, 20PE14, 20PE19, 20PE20. All have separate mesh and 90mA heater.

⅔in Newvicons/Ultricons

See note (1) at end.

(1) Tubes with magnetic focusing and deflection, a separate mesh and a 95mA heater.
S4075, TV9231, XQ1274, XQ1276 (has extended near infra-red response), **XQ1380** (has a radiation resistant faceplate), **Z7927, 20PE15, 4833U, 4905.**

(2) Tubes with electrostatic focusing, magnetic deflection, a separate mesh and a 95mA heater.
E5071, S4092 (has bipotential focusing lens), **S4102, XQ1275, XQ1277** (has bipotential focusing lens and extended near infra-red response), **XQ1278** (has bipotential focusing lens), **XQ1381, 4875U, 4904.**

⅔in Leddicon/Plumbicon/Vistacon

P8160, P8161, XQ1427, XQ1428. Separate mesh, 95mA heater, rear loading.

1in Vidicons

(1) Tubes with magnetic focusing and deflection.
OB2, OB7, P862, P864, XQ1030, 9620, 55850. All have an integral mesh and 95mA heater. The **XQ1031, XQ1032, 7262** and **7262A** are short, 5in. versions.

TH9806, TH9807, TH9808, TH9808N, TH9812, TH9815, TH9817, 7226. All with integral mesh and 150mA heater. The **TH9814** is a short, 5in. version.

C9132, C9153. Integral mesh, 300mA heater.

BC7735, HS200, HS200A, HS201, HS201A, P810, P826, P860, 4478, 4488, 7038, 7325, 7735, 7735A, 7735B, 8484, 10667. All have an integral mesh and 600mA heater.

BC4809, BC8541, C102B, C103B, C104B, C105B, P831, P833 (has mesh connection to ring next to target connector), **P842, P844, P847, P849, P8034A, P8038, P8203, P8204, P8205, XQ1005, XQ1006, XQ1007, ZQ1008, XQ1040, XQ1041, XQ1042, XQ1043, XQ1044, XQ1240, XQ1241, XQ1280, XQ1290, XQ1291, XQ1292, XQ1293, XQ1294, XQ1295, 2260, 4542** (has extended storage target), **4809, 4846, 8541, 8541A, 8604, 8626, 9677, 55851.** All have separate mesh and 90 or 95mA heater. The **XQ1285, 4569** and **4589** versions have a fibre optic faceplate. The following are short, 5in. versions: **P863** (has mesh connection to ring next to target connector), **P866, 9706, 9730** (mesh connection as P863), **8573A.** The **C23151** and **C23257A** are versions 4in. long.

TH9806PA, TH9807PA, TH9808PA, TH9810, TH9812PA, TH9815PA, TH9817PA, TH9818PA. All with separate mesh and 150mA heater. The **TH9814PA** is a short, 5in. version.

C102A, C103A, C104A, C105A, C9132A, C9133A, C23281 (has extended storage target), **P8030, P8031, TH9833, XQ1001, XQ1002, XQ1003, XQ1004, XQ1050, XQ1051, XQ1052, XQ1053, XQ1054, XQ1060, XQ1061, XQ1062, XQ1063, XQ1064, XQ1065, XQ1066, XQ1067, 2255, 9728, 55852.** All with separate mesh and 300mA heater. The **XQ1160** and **XQ1161** (both with mesh connection to ring next to the target connector) and the **4503A** are short, 5in. versions.

BC8507, P841, P841X, P843, P846, P848, P848D, 4589, 8507, 8507A, 8572, 8572A, 8625. All with separate mesh and 600mA heater.

(2) Tubes with electrostatic focusing and magnetic deflection.
BC8134, 4811, 8134. All with separate mesh and 90 or 95mA heater. The **4493, 4494** and **4495** are versions with reduced target area.

(3) Tubes with electrostatic focusing and deflection.
9745. Has separate mesh and 90/95mA heater. The **9802** is a short, 5in. version.

4514. Separate mesh, 300mA heater, short 5in. tube.

1in Newvicons/Ultricons

The following have magnetic focusing and deflection, a separate mesh and 95mA heater. See note (1) at end.
E5041, E5058, LLSA-100, S1200, S1201, S1202, S4076, S4119 (has extended near infra-red response), **TV9901, XQ1440, XQ1442** (fibre-optic faceplate), **XQ1443** (extended near infra-red response), **XQ1444** (has radiation resistant faceplate), **Z7975, 4532U, 4906.** The **XQ1445** and **25PE14** are short, 5in. versions.

1in Leddicons/Plumbicons/Vistacons

The following have a separate mesh, 90 or 95mA heater and are for front loading:
BC4892, BC4893[2], BC4894, P8021, P8022[3], P8023[2], P8024[2,3], P8025[4,5], P8026[2,4,5], P8190[6], P8191[2,6], XQ1070[5], XQ1071[5], XQ1072[5], XQ1073[2,5], XQ1074[2,5], XQ1075[2,5], XQ1076[2,5], XQ1090[4,5], XQ1091[4,5], XQ1093[2,4,5], XQ1094[2,4,5], XQ1095[2,4,5], XQ1096[2,4,5].

The following have a separate mesh, 90 or 95mA heater and are for rear loading:
P8141, P8142[3], P8143[2], P8144[2,3], P8145[4,5], P8146[2,4,5], P8196[6], P8197[2,6], P8442[6], P8443[2,6], XQ1080[4,5], XQ1081[4,5], XQ1083[2,4,5], XQ1084[2,4,5], XQ1085[2,4,5], XQ1086[2,4,5].

The following have a separate mesh, 190mA heater and are for rear loading:
P8147[3,4], P8148[2,3,4], P8490[6], P8491[2,6], XQ1500[3,4], XQ1501[3,4], XQ1503[2,3,4], XQ1504[2,3,4], XQ1505[2,3,4], XQ1506[2,3,4].

30mm Leddicons/Plumbicons/Vistacons

The following have an integral mesh, 95mA heater and are for rear loading:
P8000, 4591, 4816, 55875, 55876.

The following have a separate mesh, 95mA heater and are for rear loading:
P8001, P8003[2], P8005[5], P8007[2,5], P8131[5], P8133[2,5], P8135[4,5], P8137[2,4,5], 4592, 4816.

The following have a separate mesh, 190mA heater and are for rear loading:
XQ1520[4,5], XQ1521[4,5], XQ1523[2,4,5], XQ1524[2,4,5], XQ1525[2,4,5], XQ1526[2,4,5].

The following have a separate mesh, 300mA heater and are for rear loading:
BC4592, BC4593[2], BC4594[2], BC4992[5], BC4993[2,5], BC4994[2,5], E5040, E5055[2], P8008[4,5], P8130[5], P8132[2,5], P8136[4,5], P8138[2,4,5], P8400[5], P8401[2,5], XQ1020, XQ1021, XQ1022, XQ1023[2], XQ1024[2], XQ1025[2], XQ1026[2], XQ1410[5], XQ1411[5], XQ1413[2,5], XQ1414[2,5], XQ1415[2,5], XQ1416[2,5], 4593[2], 4817.

The following have a separate mesh, 400mA heater/light supply and are for rear loading:
BC4392[5], BC4393[2,5], BC4394[2,5].

1½in Vidicons

(1) With magnetic focusing and deflection.
P8207. Has separate mesh and 95mA heater.

P8217 (with mesh connection by flying lead), **8521.** These have a separate mesh and 600mA heater.

(2) With electrostatic focusing and magnetic deflection.
BC8480, 8410, 8480. With separate mesh and 90 or 95mA heater.

Notes

(1) The target with an Ultricon tube (U suffix to type number) should be set at 8-10V with respect to the cathode. Newvicon tubes are in general directly interchangeable with the equivalent vidicon with a standard target layer.

(2) Extended red response.

(3) Tube with light bias from 5V, 100mA bulb in tube socket.

(4) Tetrode electron gun (anti-comet tail tube).

(5) Tube with light bias in base. With 95mA heater tubes this is powered by a 5V, 250mA supply between pins 1 and 5. With 300mA heater tubes the power is provided by the heater circuit within the tube.

(6) Diode gun.

Whilst care has been taken with this listing of tubes that have similar parameters we cannot guarantee that a different tube type will necessarily be a satisfactory replacement.

Teletopics

SATELLITE TV

Interest in Sky Television's offerings seems to be on the increase. The number of installations surged during October to 122,000. Sky claims that over one million homes are now able to receive its service, either via a dish or cable feed. An Authorised Sky Agent scheme has been introduced. Retailers appointed as agents will receive a £25 commission for each customer they sign up as a subscriber, plus various promotional items. They will not receive extra payment for decoder installation however.

Meanwhile BSB is busy with pre-launch promotional activities. Viewers can join a "Launch Club" through retailers who participate in the scheme, paying a £10 deposit against purchase or rental of an installation. The offer will continue till the end of January. For their deposit they will be offered a free Squarial, free installation up to £60 and three months' free subscription to the Movie Channel. The viewer has to pay for the cost of the receiver of course. Ferguson has suggested a price of £259 for its first BSB receiver. Squarials are expected to sell for around £80.

Samsung has entered the UK satellite TV market with a range of dishes and receivers which are being sold as Vortec Star systems.

Chaparral Communications has opened a UK office at 10 Campbell Road, Hanwell, London W7 3EA (0157 96 587). The company was formed in 1980 and is the world's leading supplier of feedhorns. It has launched two particularly interesting items on the UK market. The 11/12 Twister feedhorn gives reception of both the 11 and 12GHz bands, enabling a single dish to be used to cover the complete Ku band. The 11/12 Twister has a suggested retail price of £125. It uses a ferrite polarity switching element that can be skewed for proper alignment with each transmission. The Monterey 20 international home satellite receiver, with a suggested retail price of £995, is designed for multi-satellite reception.

It's understood that as a fund raising measure the Bond Corporation is seeking to sell its 36 per cent stake in BSB. The Corporation's recent losses and debts of A$8bn have led to consideration of this disposal.

BUSINESS NEWS

Following an eighteen month investigation, the European Commission has proposed that anti-dumping duties be imposed on small-screen TV sets from South Korea. The duties would have to be approved by the European governments. They range from 10 per cent in the case of Daewood, 12 per cent for GoldStar and 13 per cent for Samsung to 19·6 per cent for smaller exporters. The initial complaint to the Commission was made by Philips, Thomson, Grundig and Nokia. European small-screen CTV imports from South Korea rose from 23,000 in 1984 to 1,083,000 in 1988. An investigation into exports from Hong Kong and China is continuing.

Alba has bought the right to use the Hinari brand name in the UK and all stocks.

The Italian government has taken a majority stake in brown-goods manufacturer Seleco following mounting losses. Electrolux, which acquired a major stake when it took over Zanussi, plans to sell its remaining interest. The government's stake is being passed to the government-controlled holding company IRI.

CATALOGUES

The 1990 Wizard Distributors' trade catalogue is available on request from Wizard Distributors, Empress Street Works, Empress Street, Manchester M16 9EN (061 872 5438). The company has introduced a computer ordering system via a videotext operation which will also make available to users manufacturers' technical information and over 25,000 fault descriptions with remedies, covering TV, video, audio and CD equipment.

Cirkit's 1990 industrial Catalogue, with 320 pages and a newly designed layout, is now available free from Cirkit Distribution Ltd., Park Lane, Broxbourne, Herts EN10 7NQ (0992 444 111). It's divided into 28 specialised sections that give full technical and ordering details.

Bi-Pak's new 1990 catalogue is available free on request from the company at PO Box 267, Southampton SO9 7XW (0703 231 003).

ERL Ltd., 1 Moor Park Industrial Centre, Tolpits Lane, Watford, Herts WD1 8SP (0923 55 344), is now the exclusive distributor for the ECA range of semiconductor equivalents/data books. The company has available free a catalogue giving complete details of the ECA range of publications.

SERVICING AIDS

Welwyn Tool's hand-held hot-air tool for working on surface-mounted devices is now available as part of an SMD rework kit. The kit comprises a 7A1 240V Labor hot-air tool and stand, soldering nozzle, PCB holder, solder wick/gun, PCB cleaning spray can, syringe and solder paste for resoldering, magnifier and eyepiece for inspection, plus pliers, a screwdriver and tweezers. For mobility the kit is contained in a tailor-made case. The Leister Labor hot-air tool with electronic temperature control between 20 and 600°C and its extensive range of nozzles is a highly effective way of dealing with SMDs. Further details can be obtained from Welwyn Tool Co. Ltd., 4 South Mundells, Welwyn Garden City, Herts AL7 1EH (0707 331 111).

The Fast Fix TV fault card filing system available from Alan Humphreys, 13 Mansfield Avenue, St. Johns Park, Hawarden, Clwyd CH5 3SB (0244 532 961) provides a speedy means of referring to fault reports published in this magazine over the years 1981-1988 inclusive. An update pack will shortly be available covering faults published during 1989, also a new card filing system covering video faults published over the years 1981-89 inclusive.

IN BRIEF

The colour TV licence fee will be increased to £71 from April 1st 1990. The monochrome licence goes up to £24 on the same date . . . Improvements have been made to the BBC's Ceefax system. The use of parallel instead of serial transmission speeds up access to pages, which are now concentrated in blocks of 100 depending on subject matter to make them easier to find. The Screenflash feature, a development of Newsflash, enables the user to find out which programme is tuned in and what precedes and follows it without loosing the picture . . . The Cable and Satellite 90 Exhibition will take place at Olympia, London, from 9-11 April 1990.

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TV SERVICE SPARES

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G11 PANELS (tested), frame, IF, decoder £12.50 each. p.p. £2.00. Scan £15.00 p.p. £3.00. Power tested exchange £18.00 p.p. £2.50.
[illegible] (untested) Scan, Frame, Decoder £7.50 p.p. £2.00
[illegible]
CR POWER SUPPLY UNIT £5.00 p.p. £2.50.
MANUALS p.p. 50p, K35, 2A, 2B, CT90 £5.20. KT3 £1.20, CTX E, CTX S, CF1 £1.50, KT4, K40 [illegible]

THORN/FERGUSON SPARES

9000, 9500, 9600, 9800 PANELS tested, exchange. £8.00, Frame. Decoder £10.00 p.p. £2.50.
[illegible] decoder tested £10.00, Line/Power £20.00, Frame £10.00 p.p. £2.50
9500/9600 Line Scan £7.50, Power £10.00 p.p. £2.50
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Servicing the Panasonic NV2000/2010/3000

Nick Beer

These VCRs are now fairly old. Even when new they were somewhat sparce with respect to features, they looked pretty ordinary and required regular maintenance. So why are they still being sold in large numbers in the reconditioned market, at the same price as say an NV366 which has a much higher specification – and being snapped up as well? Perhaps it's because they are lovely machines to use and to service. They give good results and the head life is good. So they are an excellent choice for budget rental or sale. Since they are still being bought and there are no real reasons to scrap them, it's worth providing an article on servicing to help you to live with them a while longer.

The NV2000 and NV2010 are basic, top-loading machines, silver-grey in colour. The NV3000 is a portable VCR with an NV2000 mechanism, hence its inclusion in this article. This particular machine was not sold in large numbers but we do get them in, so I've provided a brief fault list at the end of this article.

Dismantling

Dismantling the NV2000/2010 is straightforward and is much the same as with its big brothers the NV7000 (see the September 1985 issue) and the NV7200. The top is held on by two bolts at the back corners: the cassette flap is held by two obvious silver-coloured bolts. With these removed, you'll find that as in the NV7000 series a red screw and a red bolt hold the screening can above the video heads/drum. The top-loading cassette carriage is held by a further four red bolts as in the NV333/NV366. The bottom is secured by six brass-coloured screws: when it has been removed the lower PCB can be hinged backwards after taking out the red screws and bolts and pushing it back and pulling it down from the front. When doing this, watch the tracking control knob – I suspect that you'll get a bit mad if you reassemble the whole thing only to find that there's no tracking knob!

Mechanical Service

When you get one of these machines it's likely that you will have to carry out a complete mechanical service (the Panasonic maintenance kit is part number VUD4087KIT). I suggest that you remove the top and bottom, unhinge the lower PCB, remove the screening can and the cassette carriage and then work first on the top of the mechanism. It'll save you time – you'll see why later.

With the carriage removed, the reel idler (VXP0329) can be replaced by removing its retaining circlip and guiding its brake arm away while you lift it off the shaft. The reel torque should be in excess of 400g/cm. It's not uncommon to find that this is very low. The brake band is held by its adjusting screw at one end and by a circlip under the back tension post at the other. So the post will have to be removed. Undo its retaining circlip and spring and lift it off. The band can then be released. The back tension should be set at 25-30g half-way through an E120 tape.

I recommend that you remove the bracket on the right-hand side at the top of the mechanism – the one that holds the loading/capstan motors, the dew sensor etc. It's secured by three brass-coloured bolts. Before doing this remove the loading and capstan belts from the motor pulleys on the underside of the mechanism. With this assembly removed you can take off the pinch roller (VXP0330) by removing its single retaining circlip and unhooking its spring. Beneath this you'll find a black plastic cover over the play idler. A single bolt secures the cover – it can be very difficult to undo due to a reaction between the screw and the chassis. Try firmly with a normal screwdriver: if it isn't easy get a very long screwdriver first rather than later – the head burrs very easily.

The play idler is available either as just the idler wheel (VXP0331), as in the VUD kit, in which case it has to be rebuilt on to its arm, or as a complete arm (VXL0763). This arm is of the same design as in the NV333/366 but with the addition of a soft brake for the take-up reel and the associated spring. To remove the arm, the pinch roller and the previously mentioned cover must first be removed. As with the NV333/NV366, when replacing the play arm ensure that it fits at the right side of the main lever underneath – use the same method as with these other machines (see the November-December 1988 issues). The take-up torque should be 130-180g/cm.

Whilst we're on the top side of the mechanism, with machines of this age you'll probably find that the hard brake pads are worn and should be replaced. They aren't in the VUD kit. Part numbers are VXZ0090 (supply) and VXZ0091 (take-up).

Video head replacement is the same as with the NV7000 and NV333/NV366 series, with two bolts and four soldered leads in this case. The discharge angle, which is secured by a single bolt, will have to be removed first of course. To simplify stock holding, the VEH0121 or VEH0103 heads can be used as replacements. The MCES Y series heads are superb replacements and offer a saving on the Panasonic ones. They are brand new, not rebuilds.

And so to the underside of the mechanism. The flat capstan belt (VDV0131) is replaced by removing the plastic cover over the pulley, the flywheel support bracket and the fan wind belt (as Panasonic call it). The latter (VDV0120) drives the reel drive assembly from the capstan flywheel. The loading belts are small and large as with the other machines we've mentioned. To replace them, unbolt the plastic guide beside the bottom of the DD unit then unclip the DD unit loom from the chassis and follow it round to the servo PCB, unplugging it here. The large belt (VDV0135) will have to be pulled up over the loom and the new one threaded over it as the loom goes through the centre of the belt's run. This palava is required because the loom isn't, as with the NV333/NV366, plugged at the DD end. The smaller belt must be replaced before fitting the new large one as it fits on the lower half of their shared loading pulley.

As with the brake band, the idlers, pinch roller etc. these belts are in the VUD kit. Two items that aren't but

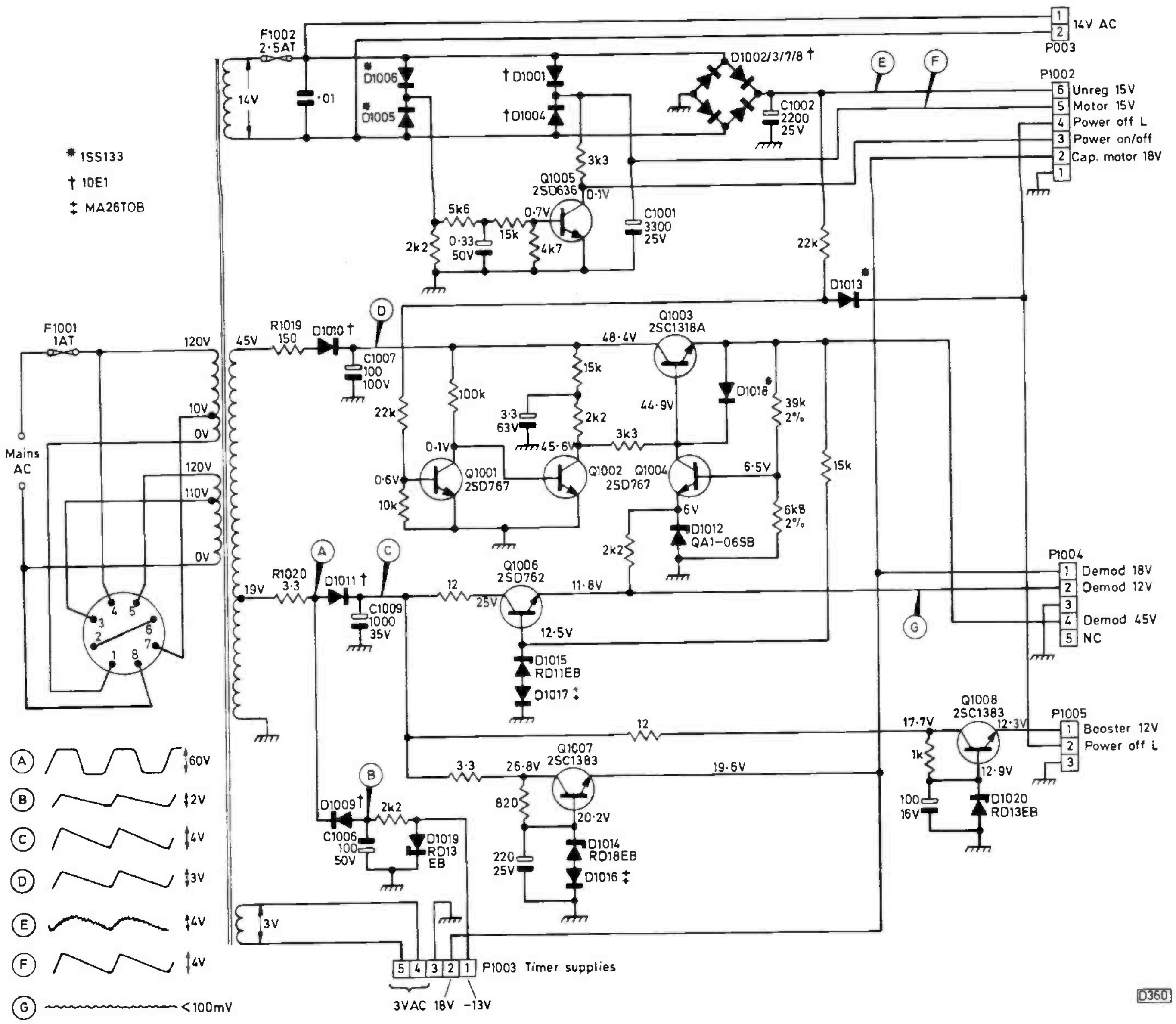


Fig. 1: Power supply circuit used in the Panasonic Model NV2000.

often need replacing are the reel pulley and the secondary pulley (VXP0351/2). These form the drive and clutch system between the belt from the flywheel and the idler itself. The clutch becomes noisy and the pulley wears. The mode switch is exceptionally reliable and thus shouldn't, as it should with more recent Panasonic models, be replaced as a matter of course.

Faults List

That sums up the mechanical side. Fig. 1 shows the power supply circuit, with some corrections with respect to the circuit in the manual. The ripple characteristics at various points are included. We'll round off with the usual faults list.

(1) Will not, or sluggish, rewind or fast forward. The most likely suspects are the reel idler (VXP0329) and the capstan belt (VDV0131). The clue is usually whether the fault is in both directions: if it is, suspect the idler; if it's in only rewind or fast forward suspect the belt. If the latter is o.k. check the so-called fan belt (VDV0120) and the two-part clutch gear assembly (VXP0351/2). Alternatively for no rewind and/or fast forward relay RY2001 (VSY2026) may have dirty contacts.

(2) No clock/clock won't set/won't keep correct time. Usually due to a faulty MN1435VX timer chip (IC7501). Sometimes ancillary components can be at fault. Check X7501, D7501/2/3 and Q7501 (2SD636). See also fault (3).

(3) No clock, hum on E-E sound and vision, capstan servo incorrect. All due to C1009 (1,000μF, 35V) being faulty.

(4) Mechanics stuck in the stop mode, won't eject, otherwise o.k. D6010 (MA165) faulty, inhibiting the loading motor. Also check the condition of the large loading belt (VDV0135).

(5) No mechanical operation but will eject. Cassette sensor lamp (XAMV0019) is probably open-circuit. If it's o.k., check the driver transistors Q6024/7 (2SD636/2SB641). Note that the sensor lamp is pulsed on and off, not lit continuously.

(6) No go, no E-E, clock o.k. No 9V as the MN1405VQ syscon microcomputer chip IC6001 is faulty.

(7) No E-E vision. Trace the signal path through the demodulator module. If the signal is present at TP3001, suspect IC3004 (AN6332). If not, suspect IC701 (BN5111B).

(8) Won't switch on, clock flashing. Fault in the 12V regulated supply. Check transistor Q1008 (2SC1383) and zener diode D1020 (RD13EB).

(9) No record or playback colour. Check the following items and replace as necessary: C8035/6, D8009, IC8003 (AN6371).

(10) Capstan rotates constantly. Dry-joint on Q6032.

(11) Capstant runs at high speed. Capstan free-run control-1 R2070 open-circuit or no FG output from motor (VEM0133).

(12) No capstan rotation. Relay RY1's contacts dirty or coil open-circuit.

(13) Wow on playback sound. Check play idler (VXP0331) but usually IC2005 is faulty.

(14) No drum lock. Check Q2002, Q2003, IC2001, C2025/6.

(15) No take-up. Check play idler (VXP0331), pinch roller (VXP0332) and the loading belts (VDV0122 and VDV0135).

(16) Snowy picture via r.f. loopthrough – looks like an r.f. amplifier fault. Check the 12V supply to the booster. If missing check Q1008 for dry-joints on all legs and/or shorts and/or R1008 (12Ω, 0·25W fusible) open-circuit.

(17) No capstan motor rotation. Q2013 and/or Q2015 faulty.

(18) Sensor lamp not working, no auto stop but mechanism works. Q6025/6 in the syscon department faulty.

(19) High-speed knocking with fast wind. Replace noisy pulley/clutch VXP0351 and lubricate pinion.

(20) "WED" partially illuminated on display. D7513 leaky.

(21) Cuts out on play as capstan motor stops. Q2012 faulty.

(22) No cue. Q6206 faulty.

(23) Cassette jammed, tape stuck laced half way. Faulty loading belts.

(24) Can't set minutes and hours change with day button. Reset the blue trimmer R7507 on the timer PCB to give 6μsec pulses measured at the potentiometer.

(25) No tuner or record operation. Q1006 (2SD762) faulty.

(26) No record colour. Colour-killer preset R8078 noisy.

(27) Random syscon misoperation/LEDs flashing. Syscon microcomputer chip IC6001 faulty.

(28) No functions with capstan motor running continuously. R6038 (68Ω, 2W) in the 5V supply to the microcomputer chip open-circuit.

(29) Timer microcomputer chip IC7501 fails. Add a 10μF, 50V capacitor across C7503.

(30) Squeaking while lacing or unlacing. Remove reel spools and clean and lubricate the mechanism spindles. The noise usually comes from the supply spool. Be very careful not to spill oil over the drive surfaces. Use Technics RZZ0L02 #56 oil.

(31) Squeaking in play or record. Noise comes from drum due to discharge angle. Replace this item with the sturdier VXA1584.

(32) Corrugated verticals and sqeaking noise. Clean or replace the erase head (VBS0014), the impedance roller (plastic type now in maintenance kit) or the audio/control head (VBR0036).

(33) Carriage won't stay down. Check for broken plastic lever (VXA1210) on the latching mechanism.

(34) No deck functions. Check the cassette down switch (VES0129) on the latching mechanism beneath the deck.

(35) Scraping noise in play or record. Check grease on flywheel bracket.

(36) Wow on sound with noise bars rolling through the picture. No capstan servo action due to absence of control pulses. Clean or replace the audio/control head (VBR0036).

(37) Grainy picture. Check the condition of the video heads and, at TP3007 and TP3008 (earth), that the record level isn't in excess of 150mV. Adjust with R3022.

The NV3000

Finally a short faults list for the NV3000.

(1) No sound with own recordings, playback o.k. Faulty microphone socket (VJJ0076).

(2) No playback or E-E vision. C3077 or IC3004 (AN6332) faulty.

(3) No deck functions, power cuts off after a few seconds. MN1405VQ syscon microcomputer IC6201 faulty.

(4) Dew light permanently on. IC6205 (AN6912) faulty.

(5) Wow on sound, noise bars on picture. IC2003 (AN6341N) faulty.

CORRECTIONS

Several points in the December issue require correction/amendment.

(1) The Salora J chassis was also used in some 16in. sets. The line driver transistor (last paragraph, page 102) is TB500, not TB501. Item (2) in the faults list, page 104, should have given CB400 and CB410 as being the usual causes of distorted field scan. CB410 is the scan coupling capacitor and is usually 1,000μF. CB412 is innocent!

(2) In CD Player Casebook, page 124, JVC Model XL-V2B, the tracking offset control is adjusted with TTS and TSS earthed (not TTS and TTS!).

(3) VCR Clinic, page 127, mentions the rack slider problem with the B and O VHS82. When this fault is encountered the rack slider should be replaced. It comes as a kit of parts, all of which must be fitted. This is a lengthy job and is tricky until you've done a few. A check on the rear edge of the old rack slider will usually reveal a pit or indentation which will confirm the diagnosis.

The mechanism is a Philips one, so the point is also applicable to many Philips machines, also Tatung and Pioneer models including the VR505 and VR707.

(4) The two electrolytics in the Rediffusion Mk. 3 chassis mentioned in Dave Mackrill's letter (page 108) should have been specified as 6C14 and 6C15 (6C12 does not cause this problem).

Christmas Caption Capers

Keith Hamer and Garry Smith

Once again Christmas approaches and we can look forward with confidence to watching favourite TV programme repeats such as Mary Poppins and the Wizard of Oz. They just have to be favourites, since they always seem to be shown at some stage during the festive season. There's a tradition at Christmas time for the BBC to discard temporarily the usual identification symbols and present special captions designed for the festivities. Some of the identification captions and modified test cards used over the years were featured in the May 1978 and January 1984 issues of *Television*. In this article we shall again raid the archives, which should please a number of readers who wrote in following our previous explorations.

It seems that the authors' collection of photographs and videos of the BBC's graphic design output is the most extensive in existence. Certainly the BBC does not have any photographs available. This is mainly due to the fact that most of the earlier mechanical symbols consisted of colourless bits that were held together with string and sealing wax – well, almost! Normally the identification lettering was on a piece of card positioned just in front of the working model. When viewed by a TV camera and colour synthesised (or chroma keyed) the symbol came to life, but the rough and ready nature of the symbol meant that all that would appear on a finished 35mm still camera print would be a monochrome symbol complete with unwanted joints – not forgetting the string and sealing wax . . . The only way to obtain a good copy of the transmitted symbol was, and still is, to photograph it live off-air or from a video recording of it. Perhaps the BBC's graphic design department staff didn't have the time to make such a copy, so the task of keeping a permanent record has fallen on those keenly interested in the subject.

BBC Xmas Captions 1969-1976

The earliest example of a Christmas symbol in our collection dates from 1969, see Photo 1. Based on the ever-faithful globe caption, which was first used in 1963, it's a special version which was used to announce with pride that the majority of the BBC-1 Christmas programmes were in colour, following the official start of colour transmissions (BBC-1) on November 15th, 1969. The curved mirror that was normally placed behind the globe to give it an iced-cake effect was replaced with dozens of what appeared to be loose fitting sequins. These moved as a result of vibration, catching the light to give a very colourful effect. As far as we can tell the globe differed from the standard one in that it was illuminated externally and was actually coloured rather than colour-synthesised.

The following year saw a variation on this theme. The standard globe, which was approximately three inches in diameter and lit internally, was used with the set of sequins replaced by small reflective snow flakes. See Photo 2.

It would seem that in 1971 the graphic designers were perhaps running short of ideas, time or inclination. The highly coloured globe from 1969 was hurriedly pressed into service, with 1970's reflective snow flakes. Photo 3 shows the result. There wasn't any great abundance of Christmas cheer over at BBC-2 either. The standard revolving cubed 2 was used, but with coloured swirls that emanated from the centre. Just in case anyone didn't notice the change, the revolving 2 had "Christmas" underneath.

What would the graphic designers come up with for BBC-2 in 1972? Easy: use the normal revolving 2 symbol, add a little tinsel around the edges, include the word "Christmas" and there we are. Who could ask for anything more? One curious thing about this caption, see Photo 4, was the inclusion of the wording "in colour". Curious because BBC-2 had officially been in colour since December 2nd, 1967.

Christmas 1972 was one of the rare occasions when the BBC's designers produced a variation on the clock caption, which for some reason was normally left well alone. This particular effort, see Photo 5, used the standard mechanical clock with an abstract, snake-like design around the edge. If you are wondering what the BBC-1 caption was in 1972, so are we! It's one of the few that seem to be missing from our collection. If anyone has details or a copy, please write in.

In 1973 BBC-1 departed from using the traditional globe symbol. Instead, a group of Dickensian carol singers revolved during each programme link – see Photo 6. On BBC-2 the graphic designers went berserk, festooning the revolving 2 symbol with glittering stars. This caption also included a dazzling ball within the 2. See Photo 7. An unusual feature was the inclusion of the day (Christmas Eve, Christmas Day and Boxing Day).

Unfortunately Christmas 1974 is a total blank as far as our collection is concerned. So once gain if anyone has a photograph that captures the proceedings, please let us know. We come next to 1975 and, surprise, surprise, the good old globe caption reappeared, looking remarkably (see Photo 8) like the one used in 1971 despite the different style of identification. It was a very colourful symbol however, and top marks must go to those concerned with the design. This was in fact the last time that a single globe was used at Christmas.

On BBC-2 a tinselled 2 emerged on Christmas Eve 1975, at the unveiling ceremony, see Photo 9. Unfortunately this was still the pre-VCR era, so we don't have a video recording of it. Knowing the ingenuity of the grahic designers however we suspect that the 2 symbol revolved in some way.

The final year's efforts featured in this article were in 1976. Exactly the same style of identification was used on BBC-1 as in the previous year, but the globe was replaced by a large rotating snowflake, see Photo 10. The curved background had also received treatment. Once again an extremely colourful Christmas caption had been concocted. The designers were obviously proud of their identification, because 1976 was one of those very rare occasions when even the clock caption had the logo changed – see Photo 11.

BBC-2 went psychedelic in 1976. The usual revolving 2 symbol was used, with odd lines going one way and even ones the other, but for Christmas weird and

Photo 1: BBC-1, 1969.

Photo 2: BBC-1, 1970.

Photo 3: BBC-1, 1971.

Photo 4: BBC-2, 1972.

Photo 5: 1972 Xmas clock.

Photo 6: BBC-1, 1973.

Photo 7: BBC-2, 1973.

Photo 8: BBC-1, 1975.

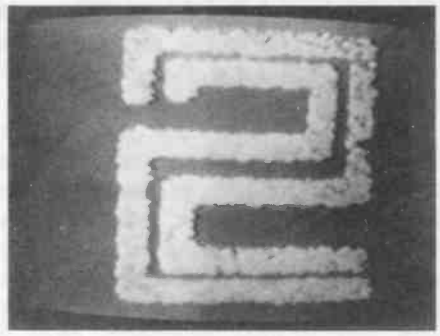


Photo 9: BBC-2, 1975.

Photo 10: BBC-1, 1976.

Photo 11: 1976 Xmas clock.

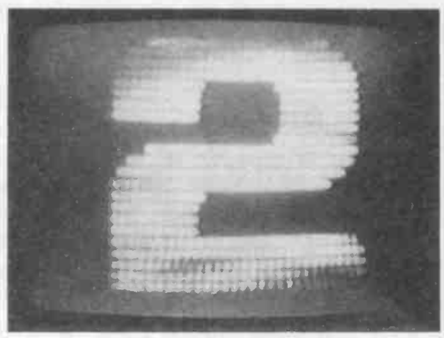


Photo 12: BBC-2, 1976.

wonderful colours emerged to give a very pleasing effect. Photo 12 shows the result. Unfortunately the full effect cannot be conveyed by a monochrome photograph, but viewers without a colour telly had the same problem and had to use their imagination.

In Conclusion

That completes our review of BBC Christmas captions from 1969 to 1976. Had space permitted we could have gone on to tell you about Santa's revolving head or the melange of medieval trumpeters, but you'll have to wait till another time. Don't forget: if you have any photographs or video recordings of pre-1980 BBC captions or test cards, please send us details. In particular we're trying to track down a video recording of the 1963 BBC Schools pie chart/grey scale tuning signal plus any music used with the BBC Test Card C. If you can help, please write to Keith Hamer, 7 Epping Close, Derby DE3 4HR, or telephone 0332 513 399.

CD Player Casebook

Reports from Mike Leach and Nick Beer

Hinari DSK2 Midi System

A stock fault seems to be developing on the Hinari DSK2 midi system – we've had three of them in recently, all suffering from the same problem. The reported symptom is usually "won't play any disc". When you've finally managed to get the CD section into a position where you can service it, something that's not easy, you can see that when the tray is closed with a disc in it the turntable doesn't rotate. If the disc is removed and the tray is closed the optical assembly lens doesn't move up and down to achieve focus. I have to stress that you mustn't stare at the beam emitted from the lens: you can see from side viewing whether the lens moves or not.

Since the turntable won't rotate until focus has been achieved, one's first suspicion would be that there's a focus drive fault. You'll find IC803 (STA341M) mounted on the PCB beneath the laser assembly: a scope connected to pin 6 of this chip should show the focus drive waveform. In each of the cases we've had the waveform was present right the way through to the optical assembly, though no movement of the assembly was apparent. We found that in each case a delicate touch on the lens with a cotton bud produced three or four focus coil movements. In one case a tiny drop of thin oil applied to the focus coil pivot restored normal operation. It's not a good idea to go pouring oil into laser assemblies, but on this one occasion it did the trick.

As yet I've not been able to prove that the laser assemblies have been faulty. It would seem that the focus coil does give problems, but our customers have not accepted the repair estimate as the laser assembly is expensive. I'd be interested in any comments from other engineers with experience of these players. Maybe someone has actually replaced an optical unit to clear this fault. Other engineers have told me that the turntable motor gives problems. Usually the disc will start to rotate, but does so very slowly then stops. A replacement turntable motor should cure this fault.

M.L.

Philips CD104

This one proved to be a difficult fault. It eventually turned out to be man made. The symptom was that the player wouldn't play past track five. There was variation from disc to disc, but towards the end of track four dropouts would occur and the machine would eventually shut down in the stop mode.

Our first move was to scope the h.f. eye pattern at pin 7 of the SAA7010 demodulator chip on the decoder panel. It was unstable, and I felt that the fault was probably mechanical rather than electrical. This was mistake number one.

Slight pressure applied to the centre of the disc clamp during play seemed to cure the trouble. I stripped the clamping mechanism to see if it was bent or disfigured in any way, then swapped over the whole clamping mechanism with one from a working machine, but no joy. As before however pressure on the clamp cured the fault. The next step was to scope the motor control waveform at pin 4 of the SAA7020 chip. It feeds the turntable motor control servo and in turn the motor, and was extremely unstable. Still suspecting a mechanical fault I changed the turntable motor, but the fault persisted.

Back to the servo board to take another look at the motor control waveform, which in Philips machines is referred to as MCES (*m*otor *c*ontrol from *e*rror correction to *s*ervo). This MCES waveform enters the turntable servo via a low-pass filter that consists of C2218, C2219, R3260, R3261 and the MC1458 dual operational amplifier chip IC6209. The voltages around this chip were all slightly wrong but were not too far out. There are two zener diodes in this circuit, and these are both critical for correct operation of the servo. They should both be 2V zener diodes but someone had replaced them with 2·5V types. Fitting 2V zener diodes cured the problem.

M.L.

Philips CD150

The complaint with this one was poor tracking when warm. We played the machine for three-four hours and everything seemed to be o.k. In fact it wasn't until the machine had played for about six hours that a fault appeared – it started to skip and jump.

Next morning we checked the laser current when cold. To do this you connect a d.c. voltmeter across test points 1 and 2, i.e. across resistor R3102 on the servo panel underneath the turntable, and play track 1 of the Philips test disc. The meter should read 50mV ±5mV. If you don't get this reading, adjust potentiometer R3106 on the servo panel *carefully* until a reading of 50mV is obtained. As this setting was correct we ran the player again all day. Once more the fault appeared after about six hours. We checked the laser current again: bang on 50mV.

The TDA5708 photodiode signal processor produces the focus error signal for the focus drive circuit and also the RE1 and RE2 radial error signals for the TDA5709 radial error processor. It was this chip that turned out to be the culprit. A touch of freezer on it restored normal results for several minutes, a replacement providing a complete cure.

We were lucky with this one. It's been my experience that freezer doesn't always provide much help in this application. It was however a heat related problem, as we proved with the hairdryer before ordering the replacement chip.

Incidentally all the chips used in Philips players are available from CPC Ltd., 186-200 North Road, Preston, Lancs PR1 1YP.

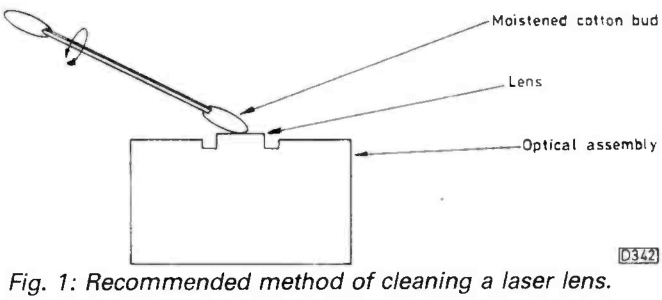


Fig. 1: Recommended method of cleaning a laser lens.

Note that you should be very careful when using a hairdryer for fault-finding. Keep the heat well away from the laser unit as excessive heat can damage it. Be careful of the flex print too. In the above case we were able to prove the cause of the fault only by disconnecting the servo board from the laser flex print, heating the chip and then reconnecting the board again. **M.L.**

Marantz CD45

This Philips-based player was part of a midi system that had suffered lightning damage. Fortunately all the items in the system are separates, otherwise we wouldn't have even considered the repair. All items other than the record deck were faulty. We removed the CD player from the rest of the system and switched on. The result was that the tray opened by itself and the display resembled Blackpool illuminations! Then the tray wouldn't close. We checked the power supply rails which were all o.k., so the MAB8441 control and display microcomputer chip on the front control panel was the next suspect. Fitting a replacement restored normal operation. **M.L.**

Cleaning Laser Lenses

I've discussed cleaning the optical assembly with several engineers. Some use a fine soft brush while some use a soft cloth with some sort of cleaning liquid, all with varying degrees of success. It's difficult to clean anything without applying pressure, but too much pressure can damage the optical lens, rendering it useless. The safest method I know of is as follows.

First try to remove the disc clamp which can get in the way. Then slightly moisten one end of a cotton bud in alcohol and lightly roll the bud over the lens. When the lens is clean, use the other end of the cotton bud to dry it completely to avoid smears etc. I've found this to be a very effective method as it requires very little pressure. See Fig. 1 **M.L.**

Technics SLXP7

This portable CD player came into our workshop with no-play symptoms. Another servicing company had said a new laser assembly was required. The customer commented that it used to play some discs all right but on others it would mistrack and would not select tracks after the TOC had been read. When he got it back with the £85 estimate it wouldn't work at all.

A quick check revealed that the r.f. (eye pattern) waveform was present at pin 15 of IC301 (AN8371S). It was extremely poor however and the laser didn't read the TOC. I was beginning to suspect the laser myself when I spotted the cause of the problem – all the mechanical adjustments on the laser assembly had been twiddled. The seals on the turntable height and pickup angle adjustments had been broken. Luckily I was able to match up the position of the turntable height screw by the shape of the broken paint around the screw head. After this the machine played but the sound was poor, with dropouts, and it took some twenty seconds for the TOC to be read. The r.f. pattern was still very poor, but fine adjustment of the two angle settings produced a much better waveform. When we'd gone through the whole set-up procedure the player produced very good results. After about five minutes of play however the front display started to show incorrect track numbers and playing time, coupled with flashing numbers on the left-hand side. A small spray of freezer on the MN6617 digital signal processing chip IC601 corrected the display, so a new chip was ordered. When this had been fitted (all 84 pins . . .) the player was returned to a very happy customer with a bill for far less than the original quote.

Two weeks later the volume control fell to bits. Still, you can't win 'em all! **M.L.**

Pioneer PD-M50

There was a shimmering display with a slow key scan – denoted by the very slow action of the buttons, i.e. having to keep your fingers on for ages. The cause was a faulty crystal oscillator timing circuit within IC3 (CXD1135QZ).

A similar fault but this time with a strobing rather than a flickering display (lower frequency) was caused by IC6 and its crystal X3 being faulty.

These faults could also occur with the PD-M40. **N.B.**

Sony CDP35

The loading belt, part number 3-653-387-00, is a weakness in this model. Check it if the tray doesn't load or unload fully or the clamping arm doesn't lift fully.

If the main PCB is not screwed in, ensure that it's earthed at all four points, using jumper leads, when taking measurements or carrying out adjustments. **N.B.**

Sony CDP-M20S

Intermittent low and very distorted sound was traced to IC9 (M515651) being thermally defective. A hairdryer and freezer were the most sophisticated items of test gear used for the diagnosis! Shame that this isn't the case every time. **N.B.**

Sony D50

There are two versions of this player. This fault affects the Mk. 1 version which has a standard d.c. spindle motor. The symptoms are sluggish disc rotation or complete failure of the disc to rotate. Removal of the toothed belt will appear to show that there's plenty of torque, but nevertheless the motor is the cause of the trouble. **N.B.**

Technics SLP-J22 Series

I've had one or two of these units with breaks in the optical unit's FPC. The symptoms have been no disc rotation due to no laser output, or intermittent skipping and/or returning to the TOC. **N.B.**

Pioneer PD-X77

The disc went in and the display worked but the disc didn't rotate. A quick check using my new credit-card type detector showed that there was no laser output, though the LD-on signal from the syscon microcomputer chip was present. The logical conclusion was a broken FPC, and a new optical unit (PWY1003) got things going – the laser diode could have been faulty of course. When the machine was set up we found that the new optical unit also cured the playability faults the customer had complained about prior to the complete breakdown. **N.B.**

Bandwidth Compression Techniques

Part 2

Tom Ivall

In this concluding instalment we'll look at bandwidth compression schemes intended for television broadcasting.

Analogue Coding Proposal

At about the same time that Bell Telephone Laboratories devised the experimental Picturephone system (see Fig. 4 and the associated text last month), Gouriet (BBC) and Cherry (London University) proposed an analogue coding scheme. This reduced the horizontal pixel-to-pixel redundancy by adaptively varying the speed of the line scanning. In this way more time was made available for transmission of the high-information parts of the picture while less time was taken to transmit the low-information parts.

The high-information parts of the picture are where there are sharp and frequent transitions between different brightness values. So the scanning beam's velocity is varied in accordance with the sharpness, or slope, of the waveform. Fig. 6 shows the basic idea. A differentiating circuit is used to measure the slope of the video waveform. It then determines the scan velocity. Thus the steep slope of a sharp edge tends to slow the beam down. As a result the slope itself is reduced until it settles down at an equilibrium value. Conversely a gentle slope makes the beam move faster.

The arrangement is a closed-loop control system in which the beam's velocity is controlled by a function of itself. Overall the effect is to smooth out the waveform and hence the information rate. The velocity of the scanning beam in the receiver is varied in synchronism, the information for doing this being derived from the modified slopes of the received waveform.

Early Digital Proposal

A later bandwidth compression scheme intended for broadcast-quality TV was devised by Wendland and May of AEG-Telefunken. This took advantage of intra-field pixel-to-pixel redundancy in the picture as well, using digital techniques and an adaptive form of differential pulse code modulation.

The system transmits only "relevant" information. This is continuously selected as the picture changes, the selection being based on a relevance criterion derived from the characteristics of human vision. In this way the system is able to exploit the eye's relative insensitivity to noise and distortion at edges and areas of high detail, as previously discussed. "Relevant" information consists of those pixel-to-pixel differences that exceed a threshold value which varies in accordance with the amount of detail in the picture. The encoder employed a relevance detector and a system using a buffer store to smooth out the transmitted information rate so that no sudden bursts of high digit rates that would exceed the channel capacity could occur.

Two techniques were used to achieve a constant-rate data output from the buffer store. Under-flow of digits was avoided by generating and feeding into the buffer "stuffing" code words. Overflow of the buffer as a result of an excessive rate of input digits was avoided by means of feedback from the buffer store to the relevance detector. The feedback signal depended on the number of digits held in the buffer. It controlled the relevance detector so that the output from this was limited as necessary. The developers claimed that the adaptive coder gave a data compression ratio of 5:1 relative to a 7-bit p.c.m. digitised TV signal.

Recent Systems

We'll complete this survey by taking a look at how the general principles of bandwidth compression previously outlined are used in some recent TV systems. As examples we'll consider a modern telecoms codec (coder-decoder) for videoconferencing and a system under development for HD-TV broadcasting.

Videoconferencing Codec

The videoconferencing codec was initiated by British Telecom but later became part of a joint European research project. It's now used by telecoms authorities throughout Europe as standard equipment in both national and international teleconference networks. The equipment accepts a standard 625-line colour video signal, applies compression and transmits the result as a p.c.m. digital code at a standard bit rate of 2Mbit/s. This standard was adopted by the Conference of European Postal and Telecommunication Administrations (CEPT). It represents a 40:1 compression of the conventional p.c.m. data rate that would otherwise by required for a 625-line signal.

Bandwidth compression is based on the fundamental principle, already outlined, of transmitting only those parts of the image that change from picture to picture. This is done by a system called conditional element replenishment – the "element" being a picture element or pixel. Two reference pictures are stored digitally, one at the transmitter/encoder and the other at the receiver/decoder. At the transmitter the incoming picture, which is digitised, is compared with the stored reference picture. When the system detects a change between these two pictures it transmits data representing this change. The change information continually updates, or "replenishes", the two references stores so that they always contain the current picture. Because the change information is an uneven data flow it has to be smoothed out for transmission. This is done by a digital buffer memory that receives the varying inflow but feeds out the data at a uniform rate.

Fig. 7 shows the essentials of the conditional replenishment encoder. As can be seen, it employs differential pulse code modulation. The analogue waveform is first digitised by an AD converter (this is not shown). The resulting 8-bit p.c.m. data stream is then fed into a two-dimensional (spatial, temporal) digital filter which processes the image to remove noise and improve the performance of the subsequent movement detector.

Moving areas of the picture are predictively coded by a d.p.c.m. encoder. This is followed by statistically

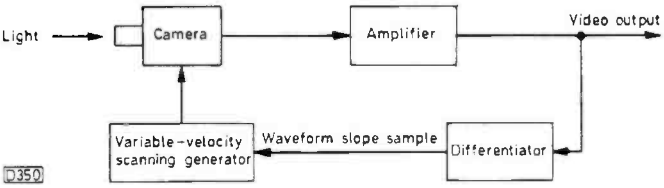


Fig. 6: Outline of a proposal for broadcast TV bandwidth compression based on the principle of varying the camera's scanning velocity automatically in accordance with the information rate (instantaneous slope) of the video waveform.

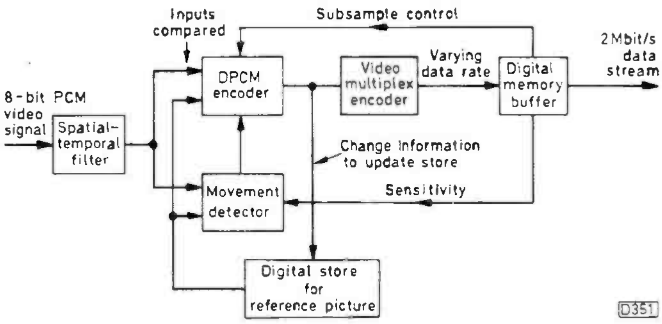


Fig. 7: Conditional element replenishment principle which is in current use in a standard telecommunications codec for videoconferencing. Reference pictures stored at the encoder and decoder are updated as picture-to-picture changes occur. Only the changes are transmitted.

matched variable length coding. In the event of a lot of movement, the resolution of the transmitted moving area is decreased by subsampling in an adaptive manner to take advantage of the fact that the eye's ability to perceive detail decreases with increasing speed of movement.

With a relatively still picture the encoder generates false moving areas to ensure that the transmitter's buffer doesn't under-flow and to replenish the picture stores at the transmitter and the receiver over several seconds to remove distortion caused by coding or transmission errors.

Control of both these modes is achieved by monitoring the content of the transmitter's buffer.

The video multiplex coder shown in Fig. 7 combines addressing data with each moving area and introduces special line and field start codes to ensure that the receiver is kept in synchronism.

For colour information an input processor either converts a composite analogue waveform into separate luminance and chrominance components (Y, U, V) or matrixes separate RGB inputs to produce YUV. It then converts these components to a digital form. The U and V chrominance components are coded in the same way as the luminance component Y.

Decoding at the receiver is of course the reverse of the encoding process shown in Fig. 7.

This codec with its bit rate of 2Mbit/s represents current practice in video telecommunications. Recently developed compression equipment is capable of operating at even lower information rates however, giving as good quality videoconference pictures at 320kbit/s as the 2Mbit/s ones and passable videophone pictures at only 48kbit/s.

Current Research

Video telecommunications research aims to reduce the bandwidth even further, employing the principle of sending digital code words to indicate features in a picture rather than transmitting in code form the actual pixels that form these features. Thus in the case of a speaking human face it might be possible to distinguish by pattern recognition ten or more different mouth positions and send a code word for each position as it occurs. A synthesiser at the receiver would produce the appropriate pictures of mouth positions in response to the received code words.

Compatible HD-TV

HD-TV broadcasting systems use bandwidth compression to achieve compatibility with standard DBS channels, signal formats and existing TV receivers. This means that the bandwidth compression system must enable HD-TV pictures with twice the vertical and horizontal resolution of a standard TV picture, i.e. with four times the total information. to be transmitted within the 24MHz or 27MHz f.m. channels laid down in the WARC 77 frequency allocations for DBS in the 12GHz band. These channels allow basebands of about 11MHz.

To achieve the required resolution, the HD-TV picture source generates signals with a bandwidth of about 30MHz for 2:1 interlaced pictures or 60MHz with sequential scanning. With both the Japanese MUSE system and the European Eureka 95 system the bandwidth compression applied gives a reduction of 4:1. The digital signal processing that achieves this reduction has two main functions, first to remove redundant information from the picture and secondly to spread selected parts of the resulting vision information over an extended period of time. The digital processing involves sampling and quantisation plus subsampling, which is resampling at a lower rate.

The Eureka 95 System

The compatible Eureka 95 system is based on an interim production standard with the following parameters: 1,250 lines interlaced 2:1; sampling at 1,440 pixels per line; a field rate of 50Hz; and a picture aspect ratio of 16:9. The redundant information which is discarded consists of diagonal image detail and fine movement detail that cannot be detected by the eye. Two two-dimensional digital filters perform this elimination task by appropriate spectrum shaping. A two-dimensional filter is one that operates in any two of the three TV picture dimensions – horizontal, vertical and time (a conventional filter such as a low-pass type is a one-dimensional filter: it modifies the vision bandwidth and thus affects the resolution in only the horizontal dimension).

As previously mentioned, the eye is less sensitive to fine detail lying in diagonal directions across the picture than to fine detail in the vertical and horizontal directions. So this fine detail is filtered out by the two-dimentional filters, leaving the vertical and horizontal resolution unchanged. Use of a method of subsampling called offset or quincunx sampling enables bandwidth compression to be introduced.

Fig. 8 shows at (a) a conventional orthogonal sampling pattern applied to a picture and at (b) the corresponding offset or quincunx pattern. The term quincunx refers to the repeated arrangements of five samples, like the five dots on one face of a gaming die, that can be discerned in this pattern. The quincunx method of sampling improves

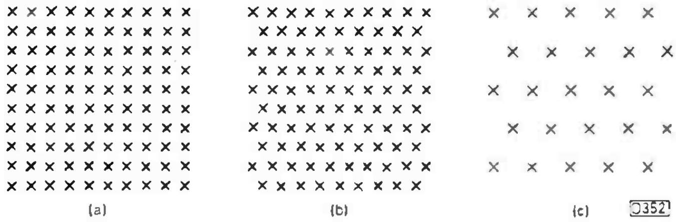


Fig. 8: Subsampling patterns used for HD-TV bandwidth compression. (a) An orthogonal pattern. (b) An offset (quincunx) version of (a). The coarser quincunx pattern shown at (c), using a lower subsampling rate, results in a reduced bandwidth requirement.

the horizontal and vertical resolution relative to orthogonal sampling but reduces the diagonal resolution. It's possible therefore to use a coarser quincunx pattern as shown as (c). This coarser pattern provides the original horizontal and vertical resolution, corresponding to (a), while giving reduced diagonal resolution. Since the eye is relatively insensitive to diagonal detail this loss due to the sampling action doesn't matter. The system uses diagnal filtering to obtain this diagonal sampling loss. The result, as shown at (c), is a sampling pattern with half the number of samples for a given area of picture. This of course means that the sampling rate is halved. Accordingly this process reduces the bandwidth requirement by a factor of two.

Luminance Encoding

Fig. 9 shows the essentials of the Eureka 95 luminance signal encoding system. The analogue luminance signal from the 1.250-line picture source is first digitised to 8-bit resolution at a sampling rate of 54MHz. This is four times the CCIR digital coding sampling rate of 13·5MHz for luminance, and has been chosen because of the 4:1 compression that follows, thus retaining the CCIR coding standard.

The reduced-bandwidth signals produced by the two two-dimensional filters are next resampled at this lower frequency of 13·5MHz. This resampling is of course performed on the luminance signal in 8-bit digital form. The lower rate resampling (subsampling) is arranged to spread the samples over a longer period of time – in this case over four transmitted fields. Thus for transmission the information in each incoming interlaced picture of two fields is distributed over four fields. Since the time taken for each picture is doubled, the information rate and hence the bandwidth requirement is halved. This gives a second bandwidth reduction by a factor of two, providing a total bandwidth compression of 4:1.

The process is effective for bandwidth compression with stationary pictures and static parts of pictures containing movement, but introduces a loss of resolution in moving parts of the picture. So the two subsampled signals are next passed to a section of the bandwidth compression system that exploits the eye's insensitivity to high spatial frequencies in moving parts of the picture. The purpose of this section is to select dynamically from the two filtered inputs an optimum signal, depending on the nature of the picture content, for transmission. It also produces a digital assistance signal which carries instructions for controlling the decoding system in the receiver.

At this stage the luminance and chrominance signals are still on the 1.250/50/2:1 standard, though in sampled and digitised form, with the subsampled signal samples distributed over four fields as already mentioned. To achieve compatibility the 1.250-line signal must be converted into the 625-line format. This is done by a process called line shuffling. The line shuffler rearranges, in a four-field sequence, samples from two successive lines in each field of the 1,250/50/2:1 picture to produce one line of a 625/50/2:1 picture. Samples from odd-numbered fields are transferred into one 625-line field while samples from even-numbered fields go into the next, interlaced 625-line field.

After this line shuffling the resulting 625/50/2:1 luminance signal, along with the U and Y chrominance signals not shown in Fig. 9, is fed to a MAC encoder. This compresses the Y, U and V signal components in time and rearranges them as a time-division mulitiplex, all by digital processing.

Wide Aspect Ratio

The wider 16:9 aspect ratio generates extra picture information relative to the standard 4:3 aspect ratio. In the high-definition MAC encoding equipment developed by the IBA this extra information is accommodated by time compressing the luminance signal by a greater amount – a factor of 2:1 (with 4:1 colour) is used instead of 3:2 (colour 2:1) with a conventional D-MAC encoder.

The Problem of Movement

The Eureka 95 system compresses the bandwidth by taking a longer than normal time to transmit the samples that comprise one complete picture, spreading them over four fields. This affects picture quality. It gives no trouble in static parts of the picture, but in moving parts it causes loss of resolution or blurring. This is obviously not acceptable for HD-TV purposes. The Eureka system has to use additional signal processing therefore to combat this impairment where movement is present. In the provisional system demonstrated at Brighton in September 1988 a motion-adaptive method of encoding is included to mitigate the problem.

In stationary areas of the picture this technique uses the four fields of samples to construct an image with high spatial resolution but poor temporal resolution. In moving areas it uses one field of samples to construct the

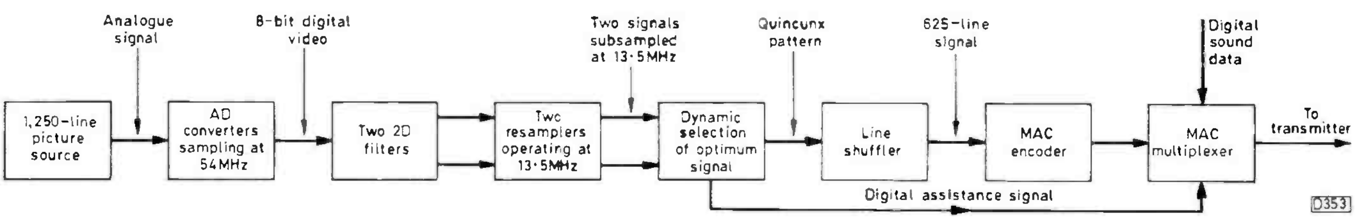


Fig. 9: Block diagram showing the main signal processing arrangements used for bandwidth compression in the Eureka 95 compatible HD-TV system. For simplicity only the luminance chain at the transmitting end is shown – this is the most critical part of the system for image resolution.

picture, the result being reduced spatial resolution but good temporal resolution. Whichever of these modes gives the better result at a given moment is selected automatically by the motion-adaptive system.

There is still an objectionable loss of resolution in areas with movement that the eye can follow, such as a slow sweep of someone's hand. Further development aims to overcome this problem by using a more refined system called motion-compensation. This measures the speed and direction of motion in small sections of the picture continuously. These "motion vectors" are transmitted to the receiver where they control digital processing circuits that enable the moving areas to be reconstructed with the same high resolution as stationary areas.

Motion-compensation is also being developed for use with visual telecommunications systems of the conditional element replenishment kind shown in Fig. 7. One purpose of this is to improve the prediction of the system and thus reduce the amount of change information that has to be transmitted.

HD-TV MAC Receiver

The digital signal processing operations shown in Fig. 9 are reversed in an HD-TV MAC receiver. This is a straightforward business: the AD conversion is reversed by DA conversion, subsampling by up-sampling, line shuffling by deshuffling and so on. The transmitted samples spread over four fields are collected together in a semiconductor memory.

We've come a long way since the proposal for bandwidth compression with mechanical scanning!

VCR Clinic

Reports from Philip Blundell, Eng. Tech., Eugene Trundle, K. Rutherford, Ian Bowden, Jim Littler, Stephen Leatherbarrow and Nick Beer

Hitachi VT33

The problem with this machine was intermittent loss of the E-E and playback picture. The video signal was present at IC202's output but was missing at pin 8 of plug PG233. It was being lost at Q210 whose base voltage was low at 1V instead of 6·7V. Tracing back we found that Q224's base voltage was also low. The culprit was C292 which was leaky. **P.B.**

GEC V4007

This machine and the Philips equivalent can suffer from broken wires to switch COD3. The symptoms are acceptance of the cassette which is then immediately ejected. The wire usually breaks where it connects to the small PCB under the deck. **P.B.**

Panasonic NV730

The weakness of the worm-wheel unit, part no. VXP0575, fitted to the front-loading mechanism in this machine was mentioned on page 20 of the November issue. A possibly puzzling symptom associated with this and other front-loading assembly faults is that the left-hand side supply spool rotates backwards for several seconds before auto-shutdown of the machine. **E.T.**

Sanyo VHR3300

The symptoms were no off-air signals, failure to tune, and the orange channel display was both dim and flashed on-off. The rest of the display was also dim, though the machine provided good playback. We found that the −30V supply to the display/key board was low at −12V because R5008 (47Ω, safety type) on power panel PW1 was open-circuit. No overload could be found and the replacement resistor has not failed. **E.T.**

Hitachi VT88

This was an unusual fault. With certain tapes there was slight horizontal picture instability, especially near the bottom, and the tracking was critical for hi-fi sound. We found that the sealant used in the factory to seal the exit guide screw top had run down and formed a blob on the guide's nylon sleeve. This also prevented the sleeve from rotating. **E.T.**

Panasonic NV-L20

We've had a couple of these machines with the back-tension arm stiff on its pivot. The effects are failure to erase previous recordings, picture rolling, and virtually unwatchable own-recordings. The machine usually works fine when it's stood on its left-hand side! The cure is to remove the lever, check that the box-section at its pivot end is square, and reassemble with a drop of lubricant. **E.T.**

Panasonic NV-MS1

Modern full-feature S-VHS camcorders are complex animals. This one had an intermittent problem – failure, sometimes, to display white-balance information in the viewfinder. The actual white-balance operation, auto or manual, was fine. It took us a long time to find out where these captions come from! There's no separate character generator chip in this machine: the operation is carried out inside the main microcomputer chip IC6001 on the syscon panel. Replacement of this chip, using a mighty magnifier, restored order to the viewfinder readout. **E.T.**

JVC GRC9, GRC11

If you encounter one of these camcorders with a no-eject problem and the power LED winks at you when you try to eject the cassette, check the dressing of the wire to the full-erase head. If it goes astray it can get caught between the trigger and detent lever on the side of the cassette housing assembly, thus preventing release of the cradle. **E.T.**

Ferguson 3V32/JVC HR7655

This machine operated at about half speed. Double speed wouldn't work and the slow-speed mode was very slow indeed. After a bit of signal tracing with the oscilloscope we found that the fault was within IC6 – the waveforms at pins 3 and 4 were totally incorrect. **K.R.**

Ferguson 3V39/JVC HRD110

The problem was intermittent sound muting, recording and E-E depending on the picture content. Dark scenes produced sound muting, bright scenes brought the sound back, while in between the sound fluttered and caused a disturbance to the picture's luminance level. The cause of the fault was traced to L7 on the tuner/i.f. panel. It should be tuned to 15·625kHz but was found to be off frequency. Normal operation was restored when L7 was peaked, using an oscilloscope, but at resonance the core was fully tightened. An un-numbered tuning capacitor within L7's can was thought to be defective. Adding an externally mounted 330pF ceramic capacitor remedied the situation. **K.R.**

Panasonic NV-G40

We've had a couple of these machines with the following complaint. After about five seconds the machine switches itself off. When we saw the report on the job card our immediate thought was of a dodgy solenoid. In fact this wasn't the case. When the mechanism solenoid sticks, the machine can't move the mechanism into the correct mode. It thus switches back to standby.

The problem was that when the tape was moving in play, fast forward, rewind etc. it would run for only about seven seconds before the machine went into the stop mode. This sounded like a reel rotation problem, so a check was made at pin 27 of the system control chip IC6001 (t.reel input). When play was selected, this input switched correctly between 0V and 5V a few times before sticking at the high level, even though the take-up reel was still moving. There's an operational amplifier, IC6002, between the system control chip and the take-up reel phototransistor. One of its inputs (pin 3) is held at

2·5V by a potential divider while the other input (pin 2) is connected to the sensor. This latter input varies between about 1V to 3V to give a change of voltage at output pin 1. When play was selected we found that the input switched from high to low but the output remained high, proving that the operational amplifier was faulty. **I.B.**

Panasonic NV180

This is a 12V machine and was used in a coach. It was brought to us because a cassette was jammed in. To release, you turn the machine upside down and remove the bottom cover at the front. At the front of the machine, near the colour auto switch, there's a release hole through the PCB to a metal plate on the cassette deck. Press this with a screwdriver and the deck will release. See page 2-3 of the service manual.

When we'd done this we discovered that the machine was dead, due to a Wickman fuse (F10J). You'll find it in the middle of the servo board at the back, near TP1003. It's in the 5V line and is not shown in early circuit diagrams, so you can be puzzled if you don't know it's there. **J.L.**

Ferguson 3V23

This machine played back o.k. but wouldn't record any picture at all, just noise. Someone else had recently fitted a new head. Naturally we assumed that it was o.k. and spent a lot of time making checks and setting up the circuits. When we replaced the head with one obtained from Ferguson normal results were obtained. The head we took out worked all right in a 3V22. **J.L.**

Ferguson 3V00/16/22 etc.

This VCR got me thinking hard – it had a fault I'd not come across before on one of these venerable machines. When play was pressed, nothing happened. No motors turned, there was no loading and no sensor operation. The play key simply stayed down. All supplies were present and the sensor lamp was not open-circuit. If the after-load switch was operated the drum turned – in fact if the pinch roller was engaged the machine loaded and played. The play microswitch on the front key PCB assembly was open-circuit. **S.L.**

Schneider SVC245RC

This VCR's tuning was very unstable. It was just possible to tune something in, but the display soon drifted off. There was also some hum on the picture and sound. A scope check on the tuner rails showed that there was some ripple present. The cause turned out to be C3 (47μF, 50V) on the power supply panel. **S.L.**

Akai VS1

There was not a beep out of this machine. The always 12V and 5V rails were found to be present and a check at pin 9 of the STK5325 chip IC1 revealed that the correct momentary low command came from the microcomputer chip when the power-on switch was operated. This instructs IC1 to switch on provided all is well. A check on its output rails proved that the supplies appeared momentarily then switched off.

Obviously the MB88401 microcomputer chip was detecting a problem. Checks here revealed that the "B down" signal at pin 5 was permanently low instead of at 5V. As a check the NTSC switching pin 6 was shorted to pin 5. This enabled the power supply, and we were on our way. The fault was traced to TR9 being open-circuit as someone in the past had shorted out the sensor lamp.

A function check on the deck then revealed a further problem. Although the VCR seemed to acknowledge the fast forward command, no motors turned in this mode. All the other functions worked correctly. The switching signal was traced up to the BA6109 reel drive chip IC6 and was found to be normal. There was no output from the chip in the fast forward mode however. I interchanged it with the loading chip as this is of the same type and there was then no tape loading, proving that the chip was faulty. A replacement put matters right. **S.L.**

Amstrad VCR4600

Nothing at all could be tuned in when using the thumbwheels. As all the tuner supplies were correct a replacement was fitted. This enabled all stations to be tuned in but the station selector buttons didn't change channel. The indicator LEDs changed but the picture remained the same. The AN5015K RAM chip on the front panel proved to be at fault. **S.L.**

Saisho VRS4000

This machine had unstable drum servo operation. The clue was a momentary sideways movement of the picture every few seconds or so. When the fault was present, selecting pause didn't change the symptom. A variation in drum speed could be heard and seen. When the connector to the lower motor was touched there were wild drum speed and phase gyrations. Since contact couldn't be improved I removed the plug and socket and soldered the wires directly. After a long soak test however the variations continued. The cause of the problem was eventually found to be a hiccup in the output waveform of IC01 (OEC9009). It's interesting that most of the chips in this machine are labelled IC01! **S.L.**

Ferguson 3V59/3V65/FV11 etc.

A fault that's becoming increasingly common with this range of machines is failure of the STK5481 multiregulator chip. You usually find that the inputs are correct but one of the three outputs is missing. Symptoms include no go with the display coming on but with no on-off LED display, or dead with the cassette being accepted but not coming out. The chips are reasonably priced and are a worthwhile addition to your spares if you see a lot of these machines. **N.B.**

Panasonic NV370E

This machine isn't a UK model but works on the UK standards. It belonged to a doctor who had brought it back with him from an overseas appointment. His complaint was that since a local contractor had fitted a new aerial the vision had been snowy. On test we found that there was severe hum on the E-E and playback sound and picture and that there was no capstan servo lock. A quick check showed that the unregulated 18V supply reservoir capacitor C1102 was severely leaky. In fact it bulged physically. It's on the mains transformer PCB. **N.B.**

Servicing Compact Disc Players

Part 11: Servo Systems – 2

Joe Cieszynski

Having looked last month at the focus and tracking servo arrangements used in the more common CD players we now move on to consider sled control and the disc rotation servo.

Sled Control

The sled, which is sometimes called the slide or carriage, transports the laser assembly across the disc, either in minute steps or at speed depending on the operation being performed. We saw last month that the two-axis device can move the optical lens through only 70μm, and that the sled is used to push the entire assembly 70μm each time the two-axis device approaches its limit. The circuit that controls the operation of the sled motor is relatively simple. It's really an extention of the tracking servo.

Fig. 11 last month showed the tracking servo circuit used in the Sanyo Model CP-08 CD player. The output from tracking amplifier-2, at pin 27 of the CX20108 chip, drives transistors Q204/5 which in turn drive the tracking coils. See Fig. 1. The tracking drive output is also coupled back to pin 25. The tracking drive waveform (see Fig. 2) has the following characteristics. There's a fundamental frequency of between 200-500Hz, depending on the rotational speed of the disc: an h.f. component that's caused by instantaneous errors introduced during the disc stamping process: and a slow ramp waveform which tracking amplifier-2 generates to move the two-axis device progressively through its 70μm travel. This ramp has a duration of two to six seconds, depending on whether the optical assembly is scanning the inner or outer edges of the disc. As the ramp approaches its peak, the tracking movement of the two-axis device will be near its limit. The ramp is therefore monitored so that the sled motor can be energised just before the peak of the ramp is reached. During period A in Fig. 2 the current is increasing and the two-axis device is being moved from its central position towards its 70μm extremity. At B the sled motor moves the laser assembly forward and the two-axis device returns to its central position. Period C is the time during which the sled motor is energised.

The sled motor is thus energised when the waveform at pin 25 of the CX20108 chip reaches a predetermined value. To ensure that the operation of the sled motor is smooth, the higher frequency tracking error signal components must be removed. This is done by the integrator R228/C211. The output from the sled d.c. amplifier appears at pin 23 of the chip. After further amplification by IC202 it's used to switch the sled motor drive transistors Q206/7. During normal play Q206 is used to move the sled forwards (outwards). Q207 is required so that the sled can be returned to the centre of the disc at the end of play or backwards during a reverse track jump. The direction of movement of the sled motor is controlled by switches TM5 and TM6 within the chip: when TM5 is closed the sled moves forwards; when TM6 is closed the movement is backwards.

It's important that the sled returns to the correct position at the end of play so that it's ready to read the table of contents at the next start of play. For this purpose a limit switch is incorporated on the deck. It operates when the sled has returned. The switch may be mechanical or optical and is connected to the main microcomputer chip which in turn tells the servo logic control system in IC201 that the sled has returned and that the sled motor must be de-energised (TM6 opened). This switch can be likened to the unload switch in a VCR. On some early players it's adjustable, the setting being critical. This is one of the first checks to carry out if the player fails to read the table of contents. Fig. 3 shows a switch of this type.

As a check to ensure that the sled has not been jolted out of position while the player was not in use, the sled moves forwards when power-on is pressed, operating the limit switch once. It then moves backwards to reset the limit switch. This routine is also performed each time a new disc is inserted, the action being initiated by the main microcomputer chip.

In many players the sled motor doubles as the loading (disc drawer) motor. This presents no problems from the

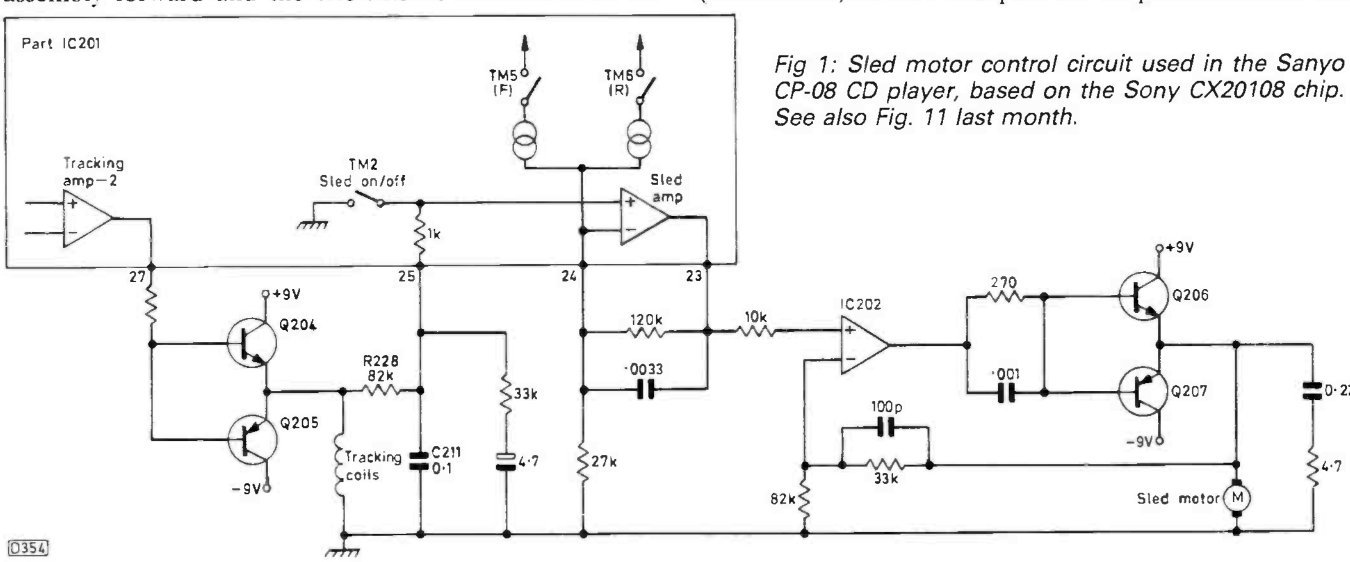


Fig 1: Sled motor control circuit used in the Sanyo CP-08 CD player, based on the Sony CX20108 chip. See also Fig. 11 last month.

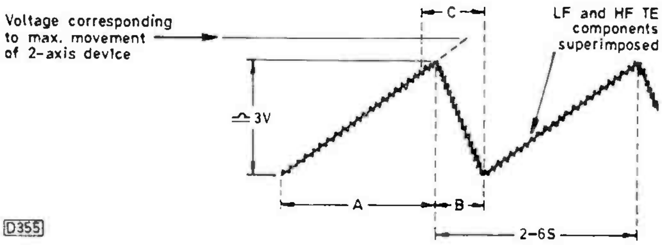


Fig. 2: Waveform at the emitters of Q204/5 in Fig. 1.

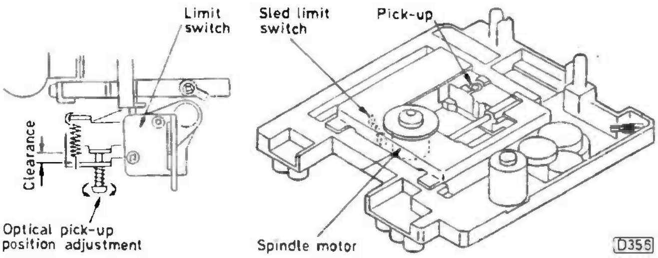


Fig. 3: Example of a limit switch used to set the initial position of the sled. On early models the switch was adjustable: the setting is critical.

point of view of the servo. The main microcomputer chip tells the servo logic control system to open TM2 and close TM5 until the draw is fully closed – closing TM6 opens the drawer. From the mechanical viewpoint this double use of the motor usually calls for a cam to perform the dual functions of sled and drawer control. We'll consider these operations in more detail when we cover deck mechanisms.

Sticking Problems

Generally speaking the sled motor control circuit is not a troublesome section of a CD player. Sticking problems are more likely to be caused by mechanical faults which we'll cover in a future instalment. You may occasionally encounter a player in which the sled remains stuck at one end of its travel and the motor possibly overheats. The most probable cause is a defective drive transistor, e.g. Q206 or Q207 in Fig. 1, a defective operational amplifier, or loss of one of the two supply lines to the sled circuit.

Philips Radial Tracking Arm

The type of mechanism with a two-axis device giving horizontal beam movement in addition to a sled is widely used in CD and other laser players. From an early stage however Philips opted to use a somewhat different arrangement that does away with the need for any horizontal optical unit movement. The principle of the Philips radial tracking arm is illustrated in Fig. 4. The arm is pivoted and is free to swing across the disc, carrying the optical assembly with it. It operates on the same principle as the moving-coil meter, but in this case the tracking servo governs the current in the coils, the servo being controlled by the tracking error signal. In Part 10 last month we saw how the TE signal is obtained with the Philips laser assembly. The direction of current through the coils for forward or reverse tracking is controlled by a transistor circuit that's similar to the one used to control two-axis device coils or a sled.

A simple way in which to compare the Philips radial arm and the double-action sled and coil is to liken the

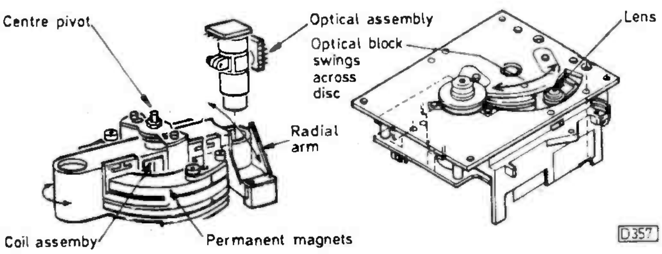


Fig. 4: The Philips radial tracking arm mechanism.

radial arm to a normal record player tone arm that tracks continuously across a disc and the sled and coil action to a linear tracking record player arm that crabs its way across the disc.

From the servicing point of view both systems are reasonably reliable as far as electronic components are concerned. Most problems seem to occur because the tracking servo is out of adjustment, possibly due to the laser ageing or changes in mechanical tolerances. Some early Philips players were prone to dry-joints, but these were fairly random and were not confined to the servo board.

The Disc Servo

The operation of a CD player's disc servo is much the same as with any other type of motor control servo in which a sample of the motor speed is compared with a stable reference source. Because the sample consists of data from the disc, and because this sample cannot be obtained until the disc's speed is approximately correct, a start-up servo is required. As we consider the disc servo part of a CD player we'll look in particular at the Sony second generation chip set in which the disc servo is included in the CX23035 decoder i.c. You'll recall that this chip set was selected to serve as a basic example throughout the series, because it's widely used by CD player manufacturers. Fig. 5 shows in block diagram form the sections of this chip relevant to disc speed control – a block diagram for the complete chip was shown in Part 8 (Fig. 2, page 925, October) where the decoder was dealt with.

The data is recorded on the disc at a constant rate of 4·3218MHz. So for the laser scanning to be kept at a constant linear velocity (CLV) of 1·2m/sec the rotational speed must be greatest at the start of play, when the laser is scanning the inner section of the disc, slowing down as the laser moves towards the outer edge of the disc. The disc's rotational speed is 486 r.p.m. at the start of play, slowing to 196 r.p.m. at the outer edge.

The block labelled "PLL servo" in Fig. 5 runs the disc during normal play. Its sample input is derived from the frame sync signal while the reference is derived from a crystal oscillator. The block labelled "rough servo" takes care of disc run up. It also takes over during normal play whenever the disc's speed is out of the PLL servo's capture range. The block labelled "fast servo" is used during track search and skip (not every model uses this).

We'll consider first the rough servo, which is more often referred to as the speed or run-up servo. The principle is shown in Fig. 6 (this particular example is taken from the earlier Sony Model CDP101). To start things off the servo gives the motor a brief "kick" – this lasts for about 0·3sec. As a result the disc begins to rotate slowly. Once this happens data can be read off the

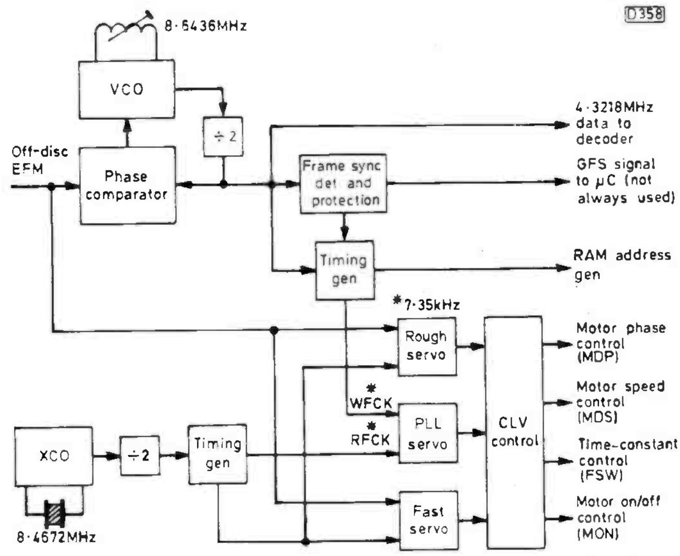


Fig. 5: Block diagram of the disc servo system in the Sony CX23035 decoder/servo chip. Note that the VCO is external to the chip.

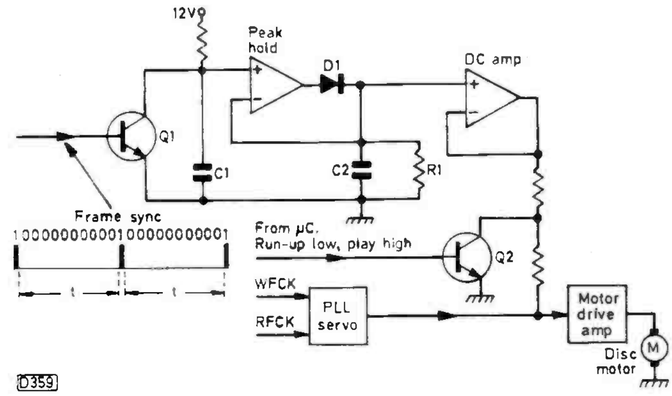


Fig. 6: Operation of the disc run-up servo.

disc, though its rate will be too slow for the decoder to be able to interpret it. The regular frame sync signal with its very distinctive 10000000000100000000010 pattern will be recognisable however (remember that, as pointed out in Parts 6 and 8, the frame period is the only time when ten consecutive zeros occur).

This data is fed to the base of Q1, which is off when a zero is present at its base. Thus when the extended zero period (frame sync) occurs C1 will charge to a peak value. The duration of the sync period (t in Fig. 6) and thus the charge developed by C1 depends on the disc's speed. This peak value is rectified by D/1/C2, the resultant d.c. level being used to speed up the disc motor. As its speed increases, the duration of the zero periods in the frame sync signal decreases and the peak charge developed by C1 falls. R1 will discharge C2 to a new lower d.c. level which further increases the motor's speed. The process continues until the frame sync frequency becomes 7·35kHz, at which point the decoder is able to interpret the data. The main microcomputer chip then sends a high signal to Q2's base, switching it on. The output from the run-up circuit is thus shorted out and the disc motor comes under the control of the main PLL servo.

To keep the explanation of this circuit's operation simple, I've shown only the peak hold part, omitting the bottom hold circuit. If reliance was placed on peak hold only and dropouts occurred during the run up the peak hold would, if the dropouts were longer than the frame sync period *t*, rise to a value far greater than during the last detected frame sync period. The bottom hold circuit is included to prevent this. It has a much longer time-constant than the peak hold and is used to maintain the last good peak hold sample.

As mentioned earlier, the rough servo also takes over control when the speed of the disc moves out of the range of the PLL servo. This can occur if the player is subjected to shock or if the disc being played has an excessive amount of dirt or grease on its surface, resulting in total loss of the data and sync. Switching between these servos is controlled by monitoring the GFS (guard frame sync) signal produced by the frame sync detection and protection system.

The operation of this system was discussed in Part 8, where we saw that missing sync signals are replaced by an internally generated sync signal which is phase locked to the off-disc sync signal. This is the signal (WFCK – write frame clock, more about this next month) that's used by the PLL servo as the sample. It can be generated and sustained only when the disc speed is correct and phase locked however. In some players the GFS signal is passed to the main microcomputer chip to provide identification that the run-up is complete and the PLL servo can thus be engaged. When phase lock is achieved the GFS signal is say "high", going "low" when lock is lost. During periods of extensive dropout the GFS signal goes low and after a predetermined time the microcomputer will re-engage the rough servo in an attempt to relock the motor as soon as the data is restored. In the event of the data loss persisting, one of two things will happen depending on player design. In some models the microcomputer will shut down the player. In others the rough servo will keep on initiating the kick-start routine with the result that the disc speed accelerates in definite increments. Eventually, with the disc spinning at a great speed, the microcomputer will initiate shut down and disc braking.

Next month we'll look at the PLL servo in greater detail.

Letters

A DEALER'S VIEW OF SATELLITE TV

Last month's answer to test case 323 led me to reflect on our experience to date with manufacturers' back-up for satellite TV equipment. The supply of systems following the launch of Astra was, as has been well publicised, a shambles. What wasn't so well publicised was the fact that with the systems that did come through at that time there was a very high percentage of missing bits, from LNBs, feedhorns and polarisers to the support rods on the early prime-focus dishes. The problem was getting replacements, spares of any kind in fact. This sort of thing applied, in our experience, with all makes. The situation has improved since then but now that we are getting receiver faults the spares supply situation is very variable. For example Salora/Luxor are superb for receiver spares, but when it comes to dish parts that have to be ordered from sales rather than NCE spares (we've had missing bits and faulty servo motor polarisers) the process is slow. There's no problem with Ferguson dish parts on the other hand, but getting spares for the less reliable receiver can sometimes take weeks.

Very few dealers or engineers had experience of satellite TV reception before Astra, and to date none of the manufacturers we deal with have offered seminars on servicing or installation. Manufacturers such as Salora and Ferguson have compensated for this omission by having excellent technical advice lines. If you've read John Breeds' books you'll appreciate the standard of back-up provided by Salora.

There are now so-called satellite TV experts around every corner. Very few are true experts, and my advice to those looking for help is to go to a company that has been established in this field for several years, with experience of things other than just Astra. The installations carried out by the local branch of a well-known High Street retailer are abysmal, for example joints in the outside downlead just coupled by means of coaxial plugs and taped up after siting the dish in the wrong place, not bothering to route a new lead. Other organisations however prove that the "big is bad" rule is wrong. I refer to Startrak, a very well organised company. Having been present when some of their installations were carried out I've been very impressed with their work. Never once had an installation to be aborted, all the hardware required is on the van and as the staff have an engineering background TV sets and VCRs are tuned for customers with no problems. The only queries that have arisen have been with B and O equipment, but since some of this is horrendously complicated we don't expect all our own staff to be familiar with it.

Naturally I can comment on only my own experience. Other dealers may have had different experiences. Let's hear yours.

Nick Beer,
Bideford, N. Devon.

GRUNDIG CUC2401 SOUND PROBLEM

In the November Service Bureau a no-sound problem with the Grundig CUC2401 chassis was mentioned. The subject is covered in a Grundig Technical Bulletin. You should start fault finding by using your scope to look for the uncontrolled a.f. output at pin 1 of the Euroconnector. If it's not present you are on your own for a bit of conventional fault finding. If a.f. is present here however, and it probably will be, you come to the interesting bit. Try to find another TV set with the same or a later chassis, fitted with the same tuner (part no. 29504.101.01), and fit its tuner in the faulty set. You should then find that you have the sound back. Don't go and order another tuner, as it's probably not faulty but has merely lost its stored data for the analogue sound setting. Look at the microcomputer chip on the control panel. It may be the early Siemens version, type SDA2011-A003, which can be replaced with the later SDA2011-A005 (part no. 8305.158.305). This will ensure that there's no recurrence, but there's a cheaper way out.

Find another set of this or a later series and check whether it's fitted with either the later SDA2011-A005 chip or one of the Motorola ones, type XC89501 or similar. Fit your "faulty" tuner to this set and switch on. It should behave o.k., confirming that the analogue values have been restored. If all is well, return the tuner to where it belongs in the original set. As a further precaution, fit a BAT41 diode (part no. 8309.198.041) with its cathode to pin 23 of the microcomputer chip and its anode to pin 20 (chassis). I had this fault a couple of years ago. The set has behaved perfectly ever since, after taking the action just described.

I believe that the colour, brightness and contrast may be affected in a similar way, since the tuner's store holds all four analogue values which are circulated around the set on the SDA line.

Les Austin,
Kirk Michael, Isle of Man.

REMOVING SURFACE-MOUNTED ICs

Here's a tip for removing surface-mounted i.c.s, as doing this takes time and can damage the PCB. Take a small screwdriver, place the blade under one corner of the i.c. to be removed, then use a Black and Decker paint-stripper hot-air gun (heat gun) directly on the i.c., taking care not to overheat the PCB. Within two-four seconds the i.c. will come off in one, leaving the board undamaged.

R. Brown,
Bradford, W. Yorks.

BROADCASTING PROSPECTS IN THE UK

While many TV writers went to the Berlin Show to boggle at the latest video offerings I made a trip to Holland to visit an old friend who had been given early retirement by a leading TV manufacturer. Living Dutch for a week in a town away from the tourist run is an excellent way of assessing the local radio/TV situation, and to me at any rate the way things are going in the UK is now much clearer.

Like much of Europe, Holland is extensively cabled. The Dutch have always thought that the country next door has better programmes, and in the past their efforts to pick up stations from across the border have damaged both their bank accounts and their gable ends. Not now. For a reasonable premium, they can get all the programmes they want, clean as a whistle, in system B/G – with 25 f.m. radio channels thrown in. Since the Dutch are delighted with this situation and need little more, VCRs and sets with teletext are very thin on the ground.

Programme selection is by "zapping". Because of their quality, BBC-1 and BBC-2 are very popular. Although the language is no problem to our Dutch friends, they did have a bit of a struggle with "Bread" and old Monty Pythons were watched with the sound down. My friend's network provided 15 channels – Dutch, Belgian and West German as well as BBC, Sky and MTV. Any new channel would have to displace an existing one, so it would have to be good to get in.

Cabling has improved the environment to the extent that there's hardly an aerial to be seen. Those wishing to instal a dish or a Yagi array face hostility from their neighbours. It seldom happens, as most are satisfied with what's on offer via the cable network.

No one knew about MAC, not even my ex-TV friend, and the impression is that the new programmes would be converted to B/G-PAL at the head end, as they did with MAC for the VCRs at the Berlin Show.

So, as the forty wind generators on the new mole at Zeebrugge waved goodbye, what was it that I was so much clearer about? First that new programmes can succeed only if more attractive than the present offerings, which is a hard target to beat in the UK. Secondly that we are on our own with D-MAC. At Berlin, widescreen and HD TV were demonstrated on D2-MAC, and no way would my friends sacrifice their choice for a wider bandwidth. And finally that deregulation has probably come too late. People are beginning to watch less. Once again we seem to be helping someone to cross the road when they wanted to stay where they were!

Harold Peters, Lowestoft, Suffolk.

MORE ON THE PANASONIC NV730

I would like to add a few notes on the Panasonic NV730 VCR as the following faults are becoming more common. Faults (1)-(3) relate to the timer board, (4) and (5) to the servo board.

(1) Machine will not switch on, no VCR "on" and no functions but the clock is o.k. These systems occur when the MN1512VTJ chip IC7503 fails. This is rather tricky to detect as the power on (L) pulse at pins 46 and 47 is simultaneously in control with the main microcomputer chip IC6001.

(2) Machine completely dead, continuously switches on and off or runs normally then switches off after two-three minutes. The reset 5V line at pin 12 of IC7305 (AN5033) goes missing. This chip also gives faults such as inability to switch between Bands V and VL.

(3) Haywire display, with no functions. This is due to failure of the MN1455BVL chip IC7501 to oscillate correctly. In addition the regulated 12.7V at BP7502, pin 1, is dumped.

(4) Drum running at maximum speed. This occurs when IC2001 fails.

(5) Capstan running at maximum speed. IC2002 fails. Capacitors C2036 and C2037 also fail – no FG pulses.

S. Da Costa,
Nairobi, Kenya.

IMPROVED REGULATION

In order to improve the power supply regulation with the Thorn 1590/1591 chassis I carried out the modification shown in Fig. 1, using a μA723C variable voltage regulator chip to drive the series regulator transistor VT21, which I changed to type TIP31. The 723 chip was mounted on a Tandy Experimenter's Board which was

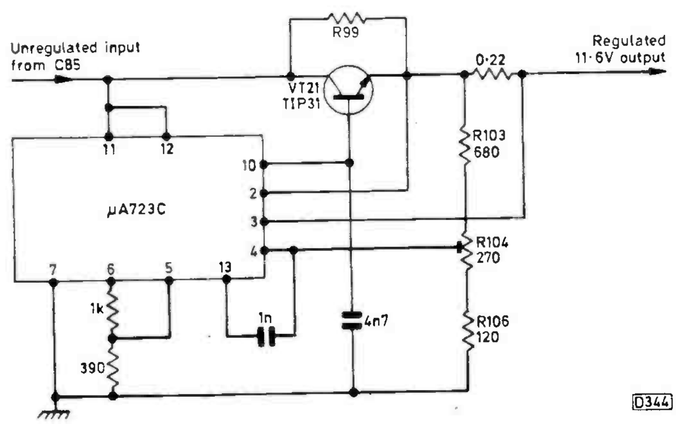


Fig. 1: Modified series regulator circuit for the Thorn 1590/1591 series chassis to provide improved regulation. See letter from K.J. Treeby.

fitted on the metal plate above VT21. The printed circuit was cut to accommodate the 0·22Ω current sensing resistor. Unfortunately, due to the physical layout the potentiometer chain couldn't be connected to the output side of this resistor. The following components were removed: R100, R101, R102, C83, C86, C87, W17 and VT22. R103 was changed to 680Ω, R104 to 270Ω and R106 to 120Ω.

K.J. Treeby,
Plymouth, Devon.

STOLEN

Several items were stolen from my car whilst I was staying overnight in Telford on a business trip. These are as follows: An Avo Model 8 in a brown leather carrying case, the probes well worn and repaired with insulating tape; two tool cases, one holding a soldering iron plus a plastic/green cloth tool roll containing various servicing tools, the other case containing tools for the car: and a red plastic spares box of the type with trays that fold out when the lid is opened, containing various electronic spare parts. I would be most grateful for any information leading to the recovery of these items, and would be prepared to offer a reward.

J. E. Bagley, Whitehall, Bewdley Bank,
Canon Pyon Road, Herts. HR4 7SH.

CAR RADIO-CASSETTE PLAYERS

I service car radio-cassette players and frequently find that the connections to the tape head have broken. The cause is usually broken cores in the lead, or the lead breaking away from the terminals on the head. Many manufacturers use very stiff screened cable, often poorly anchored. For many years I've overcome this problem by using record player pickup arm lead – the five-core, very fine flexible cable that's used to connect the cartridge to the sockets under the deck. The lack of screening hasn't caused any problems, in fact many manufacturers have started to use unscreened cable. But it tends to be rather heavy, not very flexible and it still breaks!

The problem is that I have to pay £2.40 for a 15 in. length of the pickup lead, and the source of supply will eventually dry up. I've tried to obtain this type of lead elsewhere, so far without success. Does anyone know of a source of supply, preferably by the metre? Perhaps some enterprising supplier could persuade a cable manufacturer to make some?

Geoff Davies,
Rugby, Warwickshire.

WANTED

I would like to thank those readers who have written in with details of playing NTSC tapes on UK VCRs. I'd like to obtain an 8928/JVC HR3330TR, but have so far failed to locate one. Does any dealer or individual have one for sale? If so, please write stating the condition and price (please don't send the machine until a sale has been agreed!).

If any other reader wants one, I'd be happy to keep a "want list" and pass on any offers received.

John de Rivas, West Towan House,
Porthtowan, Truro, Cornwall TR4 8AX.

Video Trouble

Les Lawry-Johns

A belt in our Fidelity VCR broke – I'm told it's a Fisher-Sanyo machine. Now I've never repaired a video recorder in my life and don't stock the belts, so I ran down to Geoff's place in Sun Lane. He fitted a new belt and tested the machine. I took it back home and it worked all right for a week or so. Then severe hum bars started to show and you couldn't watch the picture. Back it went to Geoff who kept it for a week or so because it wouldn't record the sound.

Eddy who works for Geoff had replaced some rectifiers to cure the hum bars but didn't seem to want to spend time on the loss of sound recording. Something in the i.f. panel he said. I took it home for Honey Bunch to play with. She was able to use it to play our recorded tapes but wasn't pleased about the sound recording problem and kept on at me to have a go. If Eddy couldn't find the cause of the problem, what hope had I? After some days she visited one of her daughters and came back with an elderly Sony Betamax machine. This frightened the life out of me but, with HB's son-in-law, we managed to get it going and it performs quite well. We have to have a machine so that HB's grandson can watch "Home and Away" and "Neighbours" after we've collected him from school in the afternoon.

I feel guilty about this lack of adventurousness but don't like to risk mucking things up. I still tackle TV sets of course but the call for repairs is not great nowadays, as you probably know. There are quite a lot of Ferguson portables around with dry-joints causing intermittent field collapse however.

Then there was this chap who brought in a TX10. Said it kept cutting out. He left it and I immediately checked the focus/e.h.t. unit on the right-hand side when viewed from the rear. As it was blackened I disconnected the bottom screws and hung it free as a check – I was down at the shop, and my new focus/e.h.t. units were back at the bungalow, so I had to check as best as I could. The set worked all right, showing a faded BBC-2 picture. Then suddenly there was a flashover in the faulty unit and the h.t. fuse failed. The chopper transistor had shorted, so I had to fit a new BU208A. After doing this I popped back to the bungalow for a focus/e.h.t. unit – the modified type.

When this was fitted the picture was reliable but was faint and lacked green content. I turned up the green at the c.r.t. base but the tube was obviously low. So I took the chassis out, turned it up and shorted out the resistor that's in series with the c.r.t. heaters. The heaters then glowed a bit brighter and the picture slowly improved: after a while the greens returned.

When the owner returned I showed him the picture and told him that it would improve with use. There was a problem with the remote control system, which would give only even-numbered channel selection. I couldn't find anything obviously wrong with the cables and contacts and, as the owner didn't seem to be too concerned about this, I wrapped the set up. Perhaps someone familiar with these sets would like to comment on this symptom?

TV Fault Finding

Reports from Philip Blundell, Eng. Tech., John L. Howard, Ian Bowden, Alfred Damp, J.S. Ruwala, Mick Dutton and Hugh MacMullen

Philips KT4 and K40 Chassis

A dead set is a common fault with these chassis. If the power supply is tripping, the BU508A line output transistor is probably short-circuit due to dry-joints on the line output transformer. No output from the line oscillator can be due to a dead TDA3576B chip. If the line oscillator is running but the line driver stage isn't, check whether R3192 (680Ω) is open-circuit. **P.B.**

Grundig Sat 20

For no sound, just a rushing noise, suspect the S042 chip on the sound module. **P.B.**

Grundig CUC3400 Chassis

This particular set, a T55-340, has been responsible for a few grey hairs recently. It first came into the workshop a few months ago because of intermittent tripping from cold. The line drive signal going into the TDA8140 line processor chip was o.k., but it was distorted at the output. A replacement TDA8140 cured this for a while. When the set came back the fault was fortunately permanent, so I was able to make quicker progress. I found that the power supply was tripping, though it was all right with a dummy load. If the line hold was adjusted so that the frequency was too low the power supply started up and a raster appeared. For the line deflection/switch-mode power supply (it's a variant on the Ipsalo theme) to work correctly the oscillator in the power supply must operate at line frequency. It didn't, at least not quite. The timing capacitor C653 (4·7nF) had changed value. **P.B.**

Grundig Cinema 9050

These projection sets use an early version of the CUC series chassis for the signals etc. and suffer from the usual power supply and i.f./tuner faults. They also seem to be prone to a problem that doesn't appear to affect non-projection sets, i.e. cracks in the main chassis, to the left of the tuner/i.f. can, where the tracks go round a large hole in the PCB. Faults so far have been either intermittent sound or an intermittent blank raster. **P.B.**

B and O 9000 (33XX Series)

Pumping followed by the set going to standby was traced to a dry-joint on the S-correction capacitor C18. An arc could be clearly seen through the PCB. **J.L.H.**

Salora 1G5

Although the grey scale was satisfactory, the faces had a permanent sun tan. This was corrected by adjusting the chroma delay line balancing controls. **J.L.H.**

Ferguson TX100 Chassis

This set would go off after running for a couple of hours, with the 119V h.t. supply switching relay chattering rapidly on and off. If the set was left switched off for a couple of minutes the fault would correct itself and the set would run for some time. With the fault present a check was made on the 119V and 20V supplies, which are derived from secondary windings on the chopper transformer. They were both at approximately half the correct value, which pointed to a fault in the primary side of the circuit.

A d.c. check showed that the TDA4600-2 chopper control chip's 12V supply was low at about 7V. With the aid of a scope we found that it was actually pulsing on and off at 50Hz. As a result the chopper transistor's ouput was also pulsing at this rate. This pulsing was due to the start-up circuit (thyristor SCR1 and the associated components) operating. When the set is running normally the TDA4600-2's 12V supply is produced by rectifying the output from winding 7-10 on the chopper transformer. The rectifier was o.k., but the d.c. resistance of the winding measured 50Ω. After it had been left for a few minutes to cool the resistance had fallen to the correct figure of 0·5Ω. **I.B.**

Panasonic TX2480 (Alpha 1W Chassis)

The fault report was sound but no picture. When we switched the set on a loud whine came from the power supply and, an important clue, its frequency varied. This suggested that there was no sync feedback from the line output stage which in fact wasn't working. The cause of this was traced to the 1·2Ω fusible resistor R851 which had risen in value to around 600Ω. It's in the 26V supply that powers the field output chip and the line driver transistor. Fitting a replacement restored correct working and after a check for shorts the set was put on soak test.

Some two hours later the set failed again. The fusible resistor was o.k. this time but the 26V supply was being loaded down – the voltage reading was around 22V. A check at the collector of the line driver transistor produced a reading of 0V. As its drive was still present we suspected the transistor of intermittently going short-circuit collector-to-emitter. A replacement was fitted but two hours later the set again failed. We were wondering what else could short out the collector of the driver transistor and were looking suspiciously at the driver transformer when the reason was found. There's a long aluminium heatsink that runs across the width of the main panel, between the driver transistor and the driver transformer. This heatsink is earthed by a wire that goes to a screening can. It's fixed in place by some twisted protruding legs that pass through the panel. One of these twists rested against the PCB land that's connected to the driver transistor's collector. The leg was removed with cutters and the set was again soak tested. This time there was no recurrence of the fault. When we looked in a newer set we noticed that the print layout in this area is different, in order to stop this fault happening. **I.B.**

Panasonic TX1786 (Z3-T Chassis)

The picture produced by this set had a brightness gradient. It was correct at the top left corner but was far too dark at the bottom right corner. As a first step we used the scope to check the h.t. line, the tube's first anode supply and the beam limiting voltage. Nothing was wrong with any of these. The RGB drive waveforms from the TDA3562A colour decoder chip IC601 on the vertical plug-in PCB B had a field-rate ramp superimposed on them however. Now the black level of each output is set by the d.c. voltage established by the clamp capacitors connected to pins 10, 20 and 21. These pins are connected to a common line (TPB14) via three diodes D315/6/7 which are normally reverse biased. TPB14 is connected via an 8·2kΩ resistor and pin 11 of plug/socket B1 to the collector of the UN4112 transistor Q306 on the main PCB. This transistor is used to blank the screen at switch-on – it's then conductive, pulling TPB14 down to about 5·4V. When it switches off, TPB14 should rise to 12V. The problem was that Q306 had a collector-to-emitter leak. Hence its collector voltage was low at 2V and TPB14 was low at 7V. **I.B.**

Salora 1H Chassis

This set was dead apart from a quiet pulsing from the power supply. When the chassis was moved down slightly however the set burst into life. A slight tap on the chassis produced line disturbance on the picture. We tracked down the dry-joint using a small plastic rod. It was at the lower end of CB529 (15nF, 1·2kV), the flyback tuning capacitor connected across the BU500P line output transistor TR500. **I.B.**

Pye 59KE2706 (Philips 2A Chassis)

This set had no tuning though the front display showed the correct channel number. When tuning search was initiated the voltage at the tuner unit's tuning pin remained at a constant 33V. A check on the supplies from the citac board revealed that the 5V supply to the tuner's internal 256 divider circuit was missing. R3740 (5·6Ω) on the citac module was open-circuit. **A.D.**

Tatung TV9448 (150 series Chassis)

The colour fault with this set was apparent on only some scenes. It produced the impression of Hanover bars. Its true nature could be seen with a colour-bar display: there were alternate bars of colour and no colour. The a.c.c. decoupler C516 (4·7μF) was the cause of the trouble. **A.D.**

Ferguson TX90 Chassis

The picture produced by this set had a band that moved up the screen, with picture tearing within this band. Replacing C189 (22μF, 50V) in the boost regulator circuit provided a cure. **A.D.**

Sharp C1412H

This set was dead – even the relay didn't click at switch on. The 12V supply from board D was present but there was no voltage at the base of transistor Q753 to switch it on and energise the relay. The base voltage is obtained via D1006 and IC1002. I checked the 5V rail, which was o.k. A miniature switch S1011 behind the colour control was then turned on. The relay gave a nice click but the set was still dead. The full voltage was present at pin 3 of IC701 but there was no output. Resistors R713 (330Ω) and R704 (47Ω) were both open-circuit and when these were replaced the set worked normally. To get the sound I had to return S1011 to its original position. Note that when you pull the chassis out and operate the power switch the standby switch S1009 doesn't operate. **J.S.R.**

Telefunken 615 Chassis

These sets suffer from lots of dry-joints. You'll find them around the chopper transformer TR701 and at the collectors of the chopper transistor T464 and the line output transistor T492. When the fuse has blown almost certainly the chopper transistor (S527T or 2SC1413) will be short-circuit, in which case you'll find that T462 (BC368) and zener diode D538 have also failed. D538 is a 2·1V device and it's important to replace it with the correct value. **J.S.R.**

Alba PTV10

I've come across several of these sets with an open-circuit mains transformer primary winding and am not surprised that Les Lawry-Johns didn't find the invisible fuse (October). Make sure that you replace the bridge rectifier supplied by the maker if you don't want to see the set back in two week's time. **J.S.R.**

B and O 4402

We don't see many B and O sets and it took us a while to sort this one out. The problem was no results, with only 17V on the h.t. rail and the voltages in the control section of the power supply approximately correct. The cause of the fault was 5C10 (47μF) which had gone open-circuit. **M.D.**

Ferguson TX9 Chassis

The blue was very poor. A check indicated that the tube was in reasonable condition so as a next step we swapped over the tube base leads. This proved that the fault was on the main panel. The blue clamp capacitor C64 (10nF) associated with the TDA3560 colour decoder chip turned out to be the cause of the fault. **M.D.**

Triumph CTV8205/Amstrad CTV1600

The problem with this set was no field scan. There was no field oscillator output and we found that R709 (22kΩ), which is in series with the field hold control, had gone open-circuit. **M.D.**

Philips K30 Chassis

The picture became progressively greener over a period of two hours. When cold the set worked normally and no amount of shaking etc. would bring about the fault. Eventually, after two visits, I found that the green first anode potentiometer was going open-circuit at its earthy end when heated by adjacent components. This gave rise to a gradual increase in the background green. **H.MacM.**

Philips G11 Chassis

Every now and then one of the 3·15A mains input fuses would blow. The set wasn't suffering from the usual complaints that cause this – the 470μF reservoir capacitor, the BU208A line output transistor, etc. We eventually found that R1308, which is in parallel with the mains filter choke L1305, flashed over internally every now and then. It had, on various occasions, led to failure of D3133 in the EW modulator circuit and the BU208A line output transistor. **H.MacM.**

More on VCR Back Tension

Nick Beer

There have been several developments since my article on "The Importance of Back Tension" in the August 1988 issue of *Television*. Despite the fact that incorrect back tension is the root cause of many VCR faults we don't hear much about it from the manufacturers. I shall however continue to emphasise the importance of this adjustment in my articles. In addition many of you will have seen the first results of research carried out by MCES of Manchester on the effects of incorrect back tension, the life of various types of head and the effects of video cleaning cassettes. An article relating to this appeared in the August 1989 issue of *Television* and MCES has published a wall chart that's been distributed to the trade. This article provides an update on the subject and expands on various aspects of it.

New Measuring Cassette

First, Konig has introduced a combined back tension and take-up torque measurement cassette. I've tested the VHS version in the workshop and a colleague has tested it in the field. We feel that it's excellent value for money. It comes in a hard plastic case which is similar to the type used for very early library tapes.

The scales are marked on labels that are stuck over what would, with an ordinary cassette, be the windows. Back tension is measured on the supply reel, from 0-80g/cm (this is of course actually a torque measurement). Take-up torque is measured on the take-up reel, from 50-250g/cm. A marker within the cassette is viewed against these external scales. The construction may seem to be a bit floppy but the accuracy should be within the specified range of ±2 for back tension and ±5 for take-up torque. The scales have to be reset to zero manually after each test, by turning the supply spool.

The cassette worked very well on test. The only slight hiccup occurred when it was tested with an old Ferguson 3V00: the VCR's rather crotchety carriage made the spools push up into the cassette and lock off centre, but a quick click returned them to the normal position. This could possibly have been prevented by stronger balance springs within the cassette. Note that back tension (torque) is measured in g/cm, not g as with a Tentelometer.

In view of the cost of the gauges available for measuring back tension most workshops will doubtless have only one type. The very reasonable cost of this Konig cassette gauge makes it a good choice.

Tension/torque Conversion

While most manufacturers quote back tension in g/cm (torque) some, Panasonic in particular, give Tentelometer readings in g. Many people ask about converting these figures. Conversion depends on several factors however. A cassette gauge measures in g/cm the take-up reel torque and the supply reel torque required to overcome the braking force present while a Tentelometer measures in g the force applied between its prongs (effectively the taughtness of the tape) at a position between the exit from the cassette and the entry guide prior to the drum. The only useful conversion therefore is between g/cm and tension (g) at this particular point, measured half way through a three-hour tape.

The problem in practice is that conversion depends on the mechanical arrangement used in a particular deck. For example, Fig. 1 shows the Tentelometer measuring point and a conversion graph for a typical Panasonic deck (actually an NV7000). As you can see, the tension readings are lower than the torque measurements. This is because with this design the back tension depends more on the supply reel braking than the action of the back-tension arm/post. Fig. 2 shows the same conditions for a JVC (Ferguson 3V55) deck. Here the tension readings are considerably higher than the torque ones, because the tension depends more on the back-tension arm. You will see that in comparison with the Panasonic design there's an extra post between the cassette exit and the back-tension post. The ideal situation of course would be for manufacturers to give figures for both types of measurement.

Back to the Konig Cassette

The Konig cassette is an excellent purchase for the workshop. It's about half the price of a Tentelometer or, for example, the Sharp cassette gauge, and in addition you have the take-up torque scale. A separate take-up torque gauge may well set you back another £200 or so, but will of course measure the higher fast-wind torques. The Konig cassette's accuracy with back-tension measurements may at first seem to be a little vague, but it falls well within most specifications. Being a combined unit it makes an ideal tool for field servicing, though care should be taken with handling and storage in these conditions. I suggest that for each engineer in a large company to be equipped with one will be an investment that's soon recouped as a result of quicker fault diagnosis and an improved repair throughput – not to mention the benefits that come with correct back-tension adjustment.

The cassette is available from Willow Vale Electronics at £149.95 trade plus VAT under order code 12-400.

A Philips VHS Deck Design

In the August 1988 article I quoted back tension for various Panasonic machines and showed a typical VHS deck layout. Deck designs vary, as we've seen, but Philips has come up with a mechanism that differs radically from the usual arrangement. It's used in the Philips VR6467 and various clones such as the Pioneer VR707 and the B and O VHS82. Back tension is altered in two ways with this design. First, by what's called "dynamic tape tension", and secondly by supply-reel friction. Both of these should be checked in cases where you'd normally check the back tension.

The tape tension is checked by playing back the Philips test tape and monitoring the phase jump in the white bar at the bottom of the display. It should be 8μsec or less, which equates with one colour bar width. To adjust, move spring 203 along the notches of lever

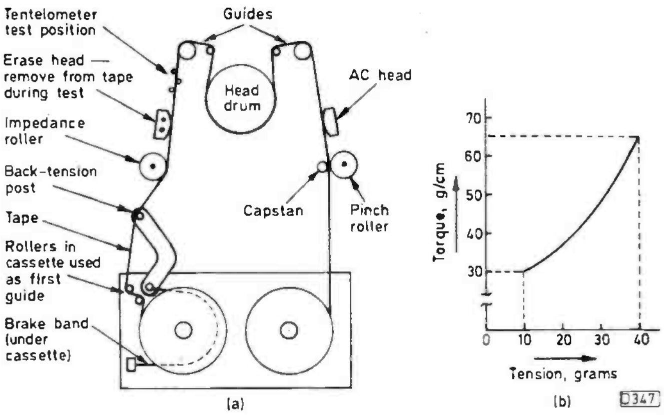


Fig. 1: (a) Typical Panasonic deck mechanism, simplified, showing the back-tension arrangement. (b) Conversion for tension/torque measurements with the D1 deck – 40-45g/cm is the correct back tension (torque).

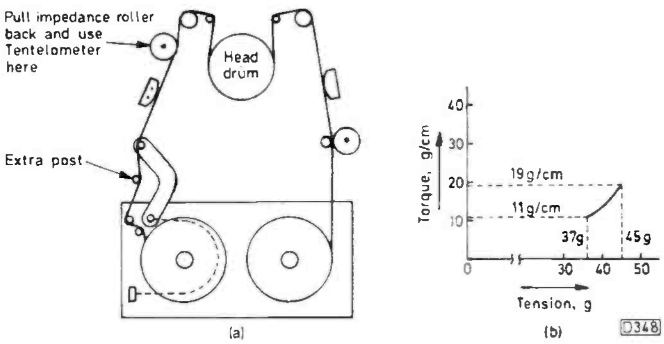


Fig. 2: (a) Typical Ferguson/JVC mechanism. (b) Tension/torque conversion for the 3V55.

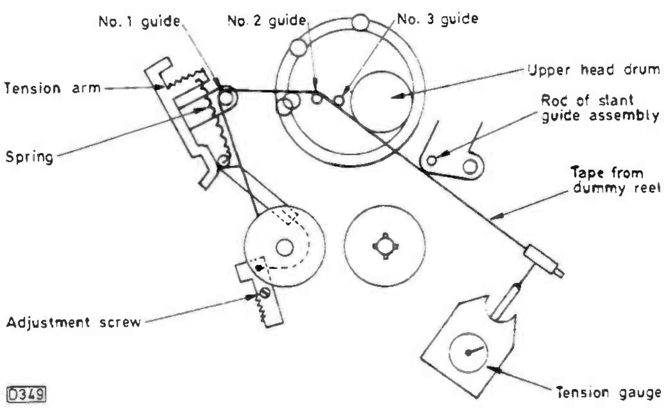


Fig. 3: Video-8 back-tension measurement. You use a fan-type tension gauge and dummy reel.

204. The supply-reel friction is checked by setting the deck in the unthreaded stop position, removing the reel brakes and then, using a hand torque meter, noting the reading in the clockwise direction. It should be 13-16gf/cm (grams force per centimetre). Alternatively use a fan-type tension gauge (see later under Video-8) and a dummy reel. To adjust the friction, set the deck in the threaded stop position, with no cassette in, and alter the position of the spring that's visible through the hole in the mechanism plate, just behind the supply spool – move it to the right to increase the friction.

VHS-C Decks

With VHS-C decks back tension is measured in different ways depending on the deck's make and age. In the case of older Panasonic machines such as the portable NV200 a Tentelometer reading in grams is specified. With later machines such as the NV-MC10 camcorder a measurement of the landing position of the back-tension post is specified. Tape tension at the traditional measuring point between the erase head and the entry guide is so low that it doesn't register with a Tentelometer. With JVC/Ferguson machines such as the 3C03 a g/cm reading is specified and this has to be measured using a VHS-C torque cassette. JVC produces such a cassette, part number PUJ50431. It's available from Willow Vale Electronics at £239.50 trade plus VAT, order code 20-300T.

Betamax Decks

With most Betamax decks the use of a cassette gauge is specified, the reading being quoted in g/cm or gf/cm. Apparently there's a Beta version of the Konig cassette, and of course Sony have such a unit (torque cassette SL-0003C). Taking as an example the Sony SL-F1, the reading should be 45-48g/cm. In this model a preset, RV202 on board LS-8, is used to adjust the back tension. It's in the capstan servo system which provides electronic torque control. Some Betamax machines use the more traditional variable spring position means of adjustment, as with a VHS deck.

Video-8 Decks

The mechanism used in Video-8 machines is of course very small in comparison with a VHS or Betamax mechanism. As well as the repair problems that this introduces, it also means that a different alignment procedure is required. With Sony machines, to check the back tension you have to remove the mechanism from the machine (camcorder or domestic model), then the cassette carriage from the mechanism. Fig. 3 shows a Video-8 back-tension arrangement. You use a fan-type tension gauge to draw tape through the tape path. The gauge measures up to 30g in either direction, and is used with another reel for take-up torque measurement. The tape is on a dummy reel.

Reel plus tape is part number J-608-083-1A while the gauge is part number J-608-082-4A (Sony part numbers). The gauge costs £77.11 trade plus VAT, the dummy reel with tape £5 trade plus VAT.

You can thus make a practice of checking the back tension with Video-8 decks as well as VHS ones. Here's an example of the benefit of doing this. I recently had to replace a faulty video head in an 18-month old Sony EVA300. I knew that it had had very moderate use. The back tension was found to be over 28g instead of the specified 12g.

In Conclusion

I shall probably have to return to this subject again later. Meanwhile if anyone has any further information or queries, please write to me via the magazine.

Addresses

Finally a couple of addresses. MCES is at 15 Lostock Road, Davyhulme, Manchester. Willow Vale Electronics Ltd. can be contacted at 11 Arkwright Road, Reading, Berks RG2 0LU (0734 876 444).

Long-distance Television

Roger Bunney

The striking feature of October's DX-TV conditions was the F2 reception from sources world-wide in Band I. Even Australian TV was seen by several UK DXers. Sporadic E conditions were also active, but the signals received seem almost parochial in comparison with the dramatic F2 catches. First as usual the F2 log:

5.10.89 CST (Czechoslavakia) ch. R2.
7/10/89 CST R1; TSS (USSR) R1, 2; SVT (Sweden) E2; MTV (Hungary) R1, 2; TVP (Poland) R1; RAI (Italy) IA; JRT (Yugoslavia) E3, 4,
8/10/89 DR (Denmark) E3
9/10/89 TVE (Spain) E2, 3.
10/10/89 +PTT (Switzerland) E2.
11/10/89 TVE E3.
13/10/89 TVE E2.
15/10/89 TSS R1; RAI IA, B; Telemarket (Italian private station) E2.
17/10/89 TSS R1; TVR (Rumania) R2; MTV R1; CST R1; TVP R1, 2; DR E3; RAI 1A; JRT E3; TVE E4.
16/10/89 TSS R1.
19/10/89 TVE E2.
20/10/89 CST R2; TVE E2, 3, 4; RAI IA.
21/10/89 TVE E2.
22/10/89 TVE E2, 3; RAI IA.
23/10/89 SVT E4.
26/10/89 TVP R1; SVT E2; TVE E2; RTP (Portugal) E3.
29/10/89 RAI IA; TVE E2, 4; TDF (France) L2.

Improved tropospheric conditions were noted across the UK on the 17th, producing Band III/u.h.f. reception from the Benelux countries and West Germany. A less active spell during the 25th produced signals from the same sources mainly in the eastern UK. Interesting catches were RTL (Luxemborg) chs. E36 and 52, SAT-1 ch. E62 and the SSVC UK land forces TV services from West Germany on chs. E23, 41 and 57.

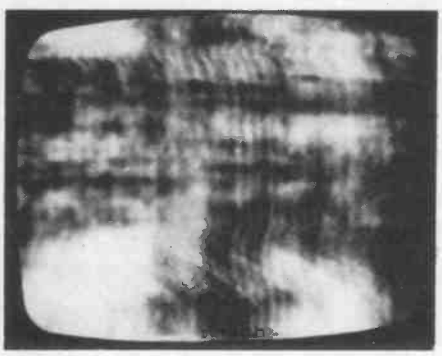
The high level of solar activity resulted in enhanced auroral conditions. Band I/III signals were noted on the 20th, Band I signals on the 21st and lower-level Band I signals on the 22nd. Reception on the 23rd and 24th was largely confined to Scotland, in Band I. There was a similar "northern" event on the 26th.

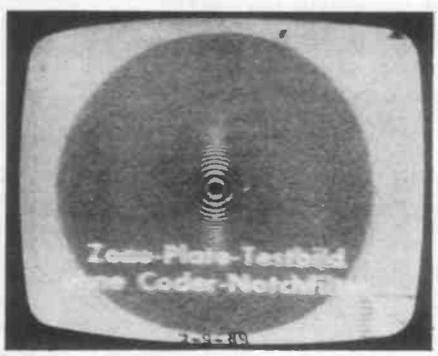
The log so far would represent a fine outcome for October. The previously mentioned F2 propagation increased the excitment considerably however with signals from very great distances almost daily, reaching up to 55MHz. The collated F2 log is as follows:

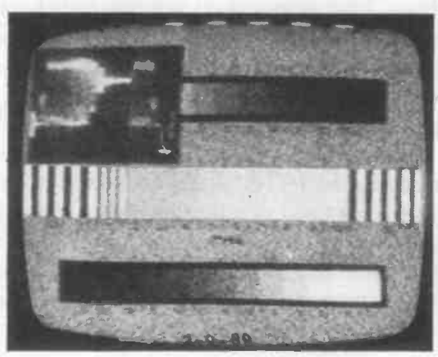
5/10/89 Unidentified colour bars from 1000-1035 BST on ch. E2.
8/10/89 Dubai UAE ch. E2 with teletext.
9/10/89 IRIB (Iran) E2.
10/10/89 ZTV (Zimbabwe) E2, with PM5534 test pattern.
11/10/89 RTM (Malaya) E2; ZTV E2.
12/10/89 TSS (USSR) R1; unidentified ch. E2 signal.
13/10/89 TSS R1; RTM E2; UAE E2; IRIB E2.
14/10/89 TSS R1; unidentified ch. R1 and E2 signals.
15/10/89 RTM E2; IRIB E2; UAE E2; football from Africa E2; Australia ch. 0, at 1010-1040 BST, confirmed by Garry Smith as DDQ-10 by measuring the vision carrier offset.
16/10/89 TSS R1; RTM E2; IRIB E2; unidentified ch. R1 signal.
17/10/89 IRIB E2; UAE E2; ZTV E2.
18/10/89 ZTV E2; UAE E2; unidentified African signal on ch. E2.
19/10/89 UAE E2; GBC (Ghana) E2.
20/10/89 UAE E2; ZTV E2 (F2 and TE, see later).
21/10/89 UAE E2; ZTV E2.
25/10/89 ZTV E2; GBC E2; UAE and IRIB E2.
26/10/89 IRIB or UAE E2 (Arabic programme).
27/10/89 UAE and IRIB E2; TSS R1; China C1.
28/10/89 TSS R1; IRIB E2.
29/10/89 UAE and IRIB E2.
30/10/89 TSS R1.
31/10/89 IRIB and UAE E2; unidentified ch. E2 signal at 1200, on programme.
1/11/89 Unidentified ch. E2 programmes; Australia ch. 0 at 0900 GMT onwards, a very strong signal.
3/11/89 TSS R1.

A quite incredible log! Several DXers have commented that TSS R1 has not been as prominent as it usually is at the start of winter F2 reception. At the peaks of past cycles TSS R1 has usually been the first and most reliable F2 signal. Cyril Willis had very interesting ZTV reception on the 20th. It appeared first as normal F2, then appeared at 1855-1925 in the more conventional TE form. This was followed by a short-lived auroral event after which, at 2017 through to 2125, a very late TE opening again produced ZTV.

Iain Menzies, monitoring the 30-50MHz spectrum via radio to check on the rising m.u.f., came across large-scale military exercises by US forces in Egypt, with call signs such as "Cobra Control", "Desert Base" etc., at 50·5MHz. The low v.h.f. band has been full of communications signals, s.w./v.h.f. harmonics, other communications "noises", distant cordless phones, US







Left: An example of "good-quality" F2 reception. Note the multiple images. F2 pictures are generally smeary with reduced h.f. content. Centre: A test pattern transmitted by Hamburg ch. E9 for receiver alignment purposes. Right: Another test pattern transmission from Hamburg ch. E9. All photos are of reception by Ryn Muntjewerff in Holland.

taxis and highway patrol operations etc. I would recommend all those interested to obtain receiving equipment for low v.h.f. signals, such as the Eddystone 770R etc. You can hear weak TV carriers long before they can be displayed on the screen. When I received Australia ch. 0 on November 1st I heard the 46·25MHz carrier long before pictures could be resolved, but listen as I did there was no indication of New Zealand ch.NZ1 at 45·25MHz. The signal levels here at Romsey, Hants on November 1st were truly amazing: very strong, though with appalling picture quality, and suffering from extremes of deep fading.

During the month Garry Smith received System M signals on ch. R1, consisting of a crosshatch pattern and thought to be a USSR transmission error – transmitting what was in effect a vision feed between the USSR and Cuba over a Gorizont circuit.

It seems that sunspot cycle 22 could be leading up to a record high: the average count for September was 176·8, with a peak day of 296!

Enthusiasts elsewhere have of course been enjoying the enhanced F2 conditions. In Perth, Australia, Anthony Mann received European Band I TV signals on chs. E2 and R1 between October 11-16th. He reports that China carries English lessons on the first network. On September 17th Anthony received China ch. C1 (vision carrier 48·27MHz) including the sound over the period 0200-0230 GMT. His log for October confirms, by offset measurement, reception of NRK (Norway) Melhus, Greipstad and Gulen on ch. E2, also either West Germany or Sweden ch. E2 and of course many ch. R1/C1 signals. This emphasises the importance of scanner use, to be able to check on the vision carrier plus offset frequency. The first 50MHz amateur radio contacts between the UK/France and Australia (Alice Springs) took place on October 11th.

A very busy and exciting month then, with the assurance of better things to come. Remember to look on the higher channels when there are signals on the lower ones – and don't forget to look westwards for possible System M, ch. A2 reception from Puerto Rico and North America.

My thanks to the following for sending in reception reports: Tim Anderson (St. Leonards), Garry Smith (Derby), Simon Hamer (Powys), David Glenday (Arbroath), Peter Schubert (Rainham), Paul Barton (Harrogate), Bill Cotterill (Tipton), Iain Menzies (Aberdeen), Mark Baldwin (Northants), Roger Fussell (Torpoint) and Cyril Willis (King's Lynn).

News Items

Belgium: Canal Plus Belgique came on air at 0700 local time on September 27th. Our contact suggests that, judging by the data signal in the last active line of each field, the initialisation point in the Discret scrambling process (pseudo-random sequence) is being changed frequently. The 6μsec sequence also appears at the end of field blanking and is thought to be related to decoder authorisation switching. The PM5544 test pattern is radiated in scrambled form prior to the start of programmes at 0700 local time – at least it was in early October.

Luxembourg: RTL-V (RTL Veronique) has been seen testing on ch. E24, over Dudelange. Ch. E49 is expected to be used at another site. RTL-V is at present available via Astra 1A.

Greece: Deregulation has been introduced and several independent broadcasters intend to set up operations.

In brief: Eesti TV (Estonia) has replaced the Tartu transmitter with one at Valgjarve. The UEIT test pattern is used with the identification "VJ 1988" . . . The e.r.p. of several of the Danish TV-2 network transmitters is to be reduced to avoid co-channel interference problems with transmitters in West Germany and Sweden . . . The Italian RAI-UNO and TV-5 satellite TV programmes are being transmitted in certain parts of Poland . . . Tunisian second service programmes are now being supplied by the French Antenne-2 service. A third network carrying RAI-UNO programmes is to be established in the near future.

Satellite TV

Several Israeli companies are offering up-market systems for reception from Astra 1A. A dish with a diameter of at least 2·5m is required. A Norwegian ice hockey outside broadcast has been seen on Intelsat 1°W, at approximately 11·5GHz horizontal. The CBS news feed to Sky TV can be seen standards-converted at certain times in the afternoon on its downlink from PanAmSat 45°W to the London Teleport.

I've installed one of the recently reviewed 65cm Salora Astra packages and can confirm the high constructional standard and the excellent reception quality. As a PDS sync processor has been acquired I no longer have the problem of stabilising the EBU news from ECS 7°E – lockable, steady pictures are obtained (the transmissions use sound-in-sync, with consequent vision instability unless steps are taken to counteract this).

Swift Television Publications, 17 Pittsfield, Cricklade,

ECONOMIC DEVICES PO BOX 15, WOLVERHAMPTON, WV2 4AZ

15/80H	2.72
15/85R	3.28
17052	4.58
17053	5.61
17074	9.30
17089	3.45
17127	2.50
17376	1.58
1N4001	0.04
1N4002	0.05
1N4003	0.06
1N4004	0.05
1N4005	0.05
1N4006	0.08
1N4007	0.07
1N4148	0.03
1N4448	0.05
1N5401	0.11
1N5402	0.13
1N5403	0.18
1N5404	0.10
1N5408	0.15
1N914	0.04
1S1555	0.31
1S44	0.10
1S921	0.10
2N2219A	0.37
2N3053	0.35
2N3054	0.99
2N3055	0.66
2N3442	1.16
2N3702	0.14
2N3703	0.18
2N3705	0.16
2N3706	0.14
2N3707	0.16
2N3711	0.11
2N3771	1.56
2N3772	1.55
2N3773	1.95
2N3819	0.40
2N3823	1.17
2N3904	0.15
2N3906	0.62
2N4101	1.33
2N4240	1.95
2N4444	1.66
2N5293	0.50
2N5294	0.50
2N5296	0.50
2N5297	0.50
2N5298	0.61
2N6109	1.58
2N6130	0.85
2N6133	1.25
2N6180	0.73
2N6292	1.60
2SA1006	1.50
2SA1011	1.65
2SA1015	0.20
2SA1012	1.25
2SA1020Y	0.88
2SA1027R	0.45
2SA473	0.75
2SA766S	4.95
2SC1173Y	1.25
2SC1474	1.25
2SC1509	1.35
2SA1095	3.00
2SA1103	6.00
2SA329	0.40
2SA489	1.17
2SA490	1.32
2SA493	2.25
2SA562	0.57
2SA564	0.62
2SA614	4.88
2SA628	0.37
2SA639S	1.75
2SA659	0.49
2SA673	1.50
2SA684	1.20
2SA697	0.80
2SA699	1.25
2SA715	0.95
2SA748	1.95
2SA817	0.18
2SA835	2.50
2SA836	0.89
2SA844	0.65
2SA872	0.59
2SA884	2.15
2SA937R	0.97
2SA940	2.23
2SA940-2	2.14
2SA950	0.72
2SA951	1.75
2SA966-Y	0.85
2SA999	0.75
2SB774	0.65
2SB185	1.13
2SB375	3.87
2SB400	0.40
2SB405	1.03
2SB511	2.65
2SB54	1.39
2SB546	0.56
2SB56	2.80
2SB618A	2.22
2SB631	2.00
2SB643	0.50
2SB669	3.67
2SB681	3.96
2SB695	1.98
2SB774	0.65
2SB819	1.13
2SC1096	1.16
2SC1104	3.98
2SC1106	4.54
2SC1114	3.25
2SC1116	4.95
2SC1124	1.26
2SC1129	1.65
2SC1131	0.64
2SC1158	3.33
2SC1162	0.55
2SC1172	2.22
2SC1195	6.09
2SC1213	0.89
2SC1226	1.46
2SC1293	0.90
2SC1306	1.98
2SC1317	0.50
2SC1364	0.49
2SC1383	1.20
2SC1391	2.45
2SC1398	0.98
2SC1413A	2.10
2SC1446	1.25
2SC1447	2.07
2SC1475	0.80
2SC1505	1.00
2SC1514	1.37
2SC1573Q	1.63
2SC1583	0.34
2SC1617	3.89

2SC1678	1.98
2SC1741	1.25
2SC1810	1.70
2SC1815	0.20
2SC1826	0.67
2SC1829	2.25
2SC1875	4.50
2SC1893	3.02
2SC1906	0.98
2SC1921	1.37
2SC1923	0.30
2SC1929	2.25
2SC1942	1.98
2SC1959	0.20
2SC1957	0.95
2SC1953	1.93
2SC1962	1.93
2SC1969	1.78
2SC1983	3.28
2SC1985	1.55
2SC2009	0.34
2SC2029	2.33
2SC2028	2.11
2SC2063	0.99
2SC2078	3.39
2SC2073	1.54
2SC2085-Q	1.65
2SC2091	1.30
2SC2141	2.44
2SC2166	0.87
2SC2216	0.69
2SC2233	1.20
2SC2236	1.69
2SC2278	1.14
2SC2314	0.87
2SC2335 + Kit	7.00
2SC2551	1.26
2SC2565	3.84
2SC2570	0.80
2SC2577	1.60
2SC2578	6.75
2SC2671	0.91
2SC288A	1.85
2SC3153	6.50
2SC372	1.40
2SC373	1.16
2SC383	1.33
2SC388	1.27
2SC394V	0.81
2SC403C	0.60
2SC458	0.34
2SC495	0.92
2SC515A	1.85
2SC535	0.79
2SC536	0.06
2SC537	0.54
2SC605L	1.15
2SC620	1.46
2SC643A	1.54
2SC668	0.67
2SC681	4.40
2SC682	1.88
2SC684	1.65
2SC693	0.63
2SC710	1.15
2SC711A	0.50
2SC717	1.20
2SC734	1.43
2SC783	3.98
2SC790Y	1.85
2SC828	0.28
2SC867A	3.04
2SC876	0.96
2SC930	0.54
2SC935	4.13
2SC940	4.68
2SD1128	2.90
2SD1138	0.94
2SD1273	1.48
2SD1453	1.33
2SD152K	2.64
2SD198	3.87
2SD234	0.47
2SD235	0.60
2SD24	2.29
2SD257	1.98
2SD292	4.09
2SD313	2.92
2SD325D	2.26
2SD350	3.05
2SD353	7.50
2SD389	2.41
2SD401	1.40
2SD414	1.58
2SD471	2.13
2SD560	2.95
2SD600	2.98
2SD601R	0.65
2SD613	1.03
2SD636	0.40
2SD639-R	0.72
2SD655	0.98
2SD657	2.88
2SD661A	0.80
2SD731	2.11
2SD773	0.60
2SD811	7.63
2SD823	1.98
2SD837	1.48
2SD841	1.75
2SD856	1.00
2SD857Q	1.84
2SD882	1.15
2SD894	1.75
2SD898	0.82
2SK105H	2.15
7805-T022	0.63
7808	0.45
7812-T022	0.55
7815	0.64
7905	0.80
AD140	1.06
AD143	1.53
AD145	1.60
AD161	0.64
AD162	0.45
AF114	2.47
AF115	0.90
AF118	1.20
AF127	1.00
AF139	0.40
AF178	1.45
AF179	0.55
AF180	0.55
AF181	0.53
AF186	0.53
AF239	0.53
AF279	0.88
AN115	3.98
AN155	1.89
AN206	2.58
AN208	3.55
AN210	2.28
AN211	3.25

AN214Q	2.40
AN234	5.08
AN236	3.33
AN240P	0.99
AN241	1.71
AN245	5.04
AN253	1.80
AN260	3.85
AN272	7.92
AN295	7.63
AN301	0.31
AN302	3.09
AN305	8.86
AN315	2.46
AN316	4.95
AN318	9.35
AN320	5.47
AN321	2.25
AN322	6.78
AN337	5.37
AN340P	1.53
AN355	2.95
AN362	1.50
AN370	3.95
AN5111	3.43
AN5120N	4.50
AN5132	4.42
AN5250	4.40
AN5410	7.43
AN5612	2.20
AN5613	4.20
AN5630	3.95
AN5701N	1.66
AN6250	1.75
AN6300	4.40
AN6310	4.54
AN6340	6.46
AN6341	2.22
AN6363	16.00
AN6531	1.95
AN6551	0.50
AN6552	0.68
AN6610	1.63
AN7111	1.25
AN7115	2.52
AN7145	2.80
AN7146	3.90
AN7151	2.37
AN7156	2.85
AN7158	2.10
AN7218	0.80
AN7223	4.55
AU107	6.77
AU110	5.69
AU113	14.63
AY105K	2.08
AY106	2.80
BA524	8.94
BA310	0.14
BA1310	1.50
BA1320	1.38
BA1322	3.95
BA1330	2.75
BA145	0.19
BA148	0.25
BA154	0.40
BA155	0.12
BA156	0.05
BA159	0.09
BA182	0.19
BA222	1.66
BA302	1.24
BA311	0.65
BA312	1.45
BA313	0.76
BA317	0.04
BA318	0.09
BA328	1.65
BA333	1.37
BA335	6.27
BA5102A	2.15
BA511	1.95
BA514	1.00
BA521	1.20
BA524	8.94
BA526	7.98
BA527	2.98
BA532	1.20
BA536	0.99
BA6209	3.21
BA656	1.00
BA7100	11.35
BA841A	28.98
BA843	3.96
BA854	5.76
BAV13	0.06
BAV19	0.11
BAV20	0.36
BAV21	0.12
BAW62	0.11
BAX12	0.14
BAX13	0.11
BAX16	0.08
BC107B	0.11
BC108B	0.15
BC109B	0.11
BC113	0.15
BC119	0.36
BC126	0.20
BC132	0.14
BC135	0.14
BC137	0.18
BC138	0.34
BC139	0.33
BC140	0.30
BC141	0.20
BC142	0.37
BC143	0.34
BC147	0.14
BC148B	0.13
BC148C	0.11
BC149B	0.13
BC153	0.14
BC154	0.14
BC159	0.16
BC160	0.40
BC161	0.28
BC168	0.36
BC169C	0.16
BC170	0.16
BC171	0.11
BC172B	0.27
BC173	0.17
BC174B	0.27
BC177	0.35
BC178	0.26
BC179	0.26
BC182LB	0.09
BC183LB	0.09
BC184	0.26
BC184LB	0.26
BC186	0.25
BC187	0.28
BC204	0.35

BC207	0.19
BC212B	0.26
BC213L	0.10
BC214	0.10
BC225	0.40
BC237	0.10
BC238	0.10
BC238B	0.08
BC239B	0.25
BC251A	0.31
BC294	0.50
BC300	0.35
BC301	0.34
BC302	0.53
BC303	0.48
BC307A	0.06
BC308A	0.11
BC309	0.17
BC317A	0.13
BC327	0.18
BC328	0.11
BC337	0.09
BC338	0.12
BC368	0.19
BC440	0.69
BC441	0.46
BC454	0.36
BC460	0.42
BC461	0.47
BC462	0.51
BC463	0.30
BC478	0.32
BC479	0.41
BC532	0.28
BC546	0.17
BC547	0.10
BC548	0.10
BC549	0.10
BC550	0.11
BC556	0.11
BC557	0.10
BC558	0.10
BC559	0.10
BC560C	0.14
BC635	0.24
BC636	0.20
BC637	0.24
BC639	0.15
BC640	0.24
BCX34	0.55
BD115	0.76
BD116	0.70
BD124	1.31
BD131	0.42
BD132	0.42
BD133	0.35
BD135	0.36
BD136	0.36
BD137	0.41
BD138	0.48
BD139	0.24
BD140	0.35
BD144	1.43
BD150	0.75
BD157	0.67
BD160	1.60
BD163	0.71
BD166	0.69
BD175	0.28
BD179	0.30
BD181	0.99
BD182	0.99
BD183	0.99
BD184	1.45
BD187	0.80
BD189	0.55
BD190	0.55
BD201	0.49
BD202	0.60
BD203	0.46
BD204	0.41
BD207	1.73
BD208	1.23
BD222	0.45
BD225	0.45
BD228	0.63
BD229	0.75
BD232	0.49
BD234	0.42
BD237	0.36
BD238	0.28
BD239	0.45
BD240	0.57
BD241	0.39
BD242	0.50
BD243A	0.39
BD243C	0.50
BD244	0.42
BD245C	0.72
BD246C	0.75
BD253	0.85
BD278A	1.05
BD317	0.70
BD318	2.72
BD375	0.45
BD380	0.76
BD410	0.49
BD433	0.44
BD434	0.44
BD435	0.49
BD436	0.74
BD437	0.45
BD438	0.52
BD441	0.59
BD442	0.50
BD509	1.64
BD510	0.75
BD519	0.98
BD529	0.94
BD530	0.99
BD533	0.67
BD534	0.82
BD535	0.49
BD536	0.50
BD537	0.50
BD538	0.67
BD544B	0.53
BD677	0.43
BD679	0.57
BD680	0.52
BD681	1.49
BD696	2.47
BD699	1.85
BD700	3.70
BD707	0.60
BD709	0.80
BD710	1.25
BD809	0.80
BD810	0.57
BD879	0.74
BD901	0.55
BD902	0.56
BDW83C	0.99
BDW84C	0.99
BDX32	1.65
BDX53A	4.93
BDX53B	3.36

BDX54B	0.31
BDX62A	2.09
BDX63A	1.96
BDY20	1.21
BDY81	1.18
BF115	0.29
BF117	0.66
BF118	0.66
BF121	0.25
BF123	0.13
BF127	0.13
BF137	0.29
BF153	0.58
BF154	0.26
BF157	0.33
BF158	0.18
BF159	0.18
BF160	0.31
BF167	0.38
BF173	0.34
BF177	0.55
BF178	0.40
BF179	0.36
BF180	0.36
BF181	0.36
BF182	0.32
BF183	0.39
BF184	0.33
BF185	0.39
BF194	0.14
BF195	0.14
BF196	0.17
BF197	0.24
BF198	0.17
BF199	0.17
BF200	0.37
BF218	0.36
BF224	0.17
BF237	0.65
BF240	0.19
BF241	0.17
BF245	0.50
BF245B	0.49
BF246A	0.71
BF255	0.20
BF256	0.28
BF257	0.34
BF258	0.33
BF259	0.34
BF262	0.57
BF263	0.57
BF271	0.34
BF273	0.20
BF274	0.20
BF324	0.23
BF336	0.33
BF337	0.31
BF338	0.40
BF355	0.56
BF362	0.60
BF363	0.50
BF371	0.50
BF391	0.25
BF417	0.84
BF418	1.87
BF422	0.18
BF423	0.33
BF450	0.33
BF451	0.29
BF457	0.41
BF458	0.49
BF459	0.26
BF460	1.63
BF469	0.33
BF470	0.26
BF471	0.25
BF472	0.33
BF479	0.61
BF480	0.43
BF491	0.50
BF506	8.43
BF532	0.24
BF596	0.18
BF597	0.27
BF694	0.27
BF757	0.47
BF759	0.47
BF761	0.40
BF762	0.34
BF869	0.29
BF870	0.30
BF959	0.14
BF960	0.50
BF970	0.50
BFR39	0.44
BFR61	0.50
BFR62	0.50
BFR79	0.29
BFR81	0.29
BFR86	0.50
BFR89	1.63
BFR90A	0.35
BFX29	0.34
BFX84	0.31
BFX85	0.26
BFX86	0.36
BFX87	0.55
BFX88	0.41
BFX89	0.30
BFY50	0.30
BFY51	0.33
BFY52	0.27
BFY79	0.49
BFY90	0.42
BLY49	2.20
BR100	0.23
BR101	0.78
BR103	0.66
BR303	1.15
BRC84	2.08
BRX44	0.60
BRX49	0.34
BRY39	0.65
BSS38	0.67
BSTB0140G	4.93
BSTC0246	5.99
BSTC0233	6.12
BSTCC0143	3.07
BSTD1043	2.85
BSV57B	3.91
BSW58	0.60
BSX19	0.34
BSX20	0.19
BSY52	0.50
BSY79	0.51
BT106	1.45
BT119	1.76
BT120	0.57
BT121	2.48
BT123	1.98
BT151-800R	0.85
BT6018	2.42
BU106	2.08
BU108	1.50
BU109	2.25
BU110	5.69
BU125	2.48

BU126	1.10
BU137	6.53
BU205	1.15
BU206	1.27
BU207	1.65
BU208	1.12
BU208/02	2.35
BU208A	1.12
BU208D	1.43
BU209	1.75
BU226	2.55
BU326A	0.99
BU406	1.49
BU406D	1.04
BU407	0.54
BU412	5.29
BU425A	1.67
BU500	1.53
BU508A	1.50
BU536	1.55
BU608	1.65
BU705	2.50
BU806	1.03
BU807	1.40
BU826A	1.95
BUW84	0.66
BUX84	0.50
BUX85	0.69
BY126	0.13
BY127	0.13
BY133	0.10
BY164	0.44
BY176	0.52
BY179	1.42
BY182	1.05
BY187	0.77
BY189	1.76
BY198	1.62
BY207	0.22
BY208	1.15
BY210-400	0.18
BY210-600	0.31
BY210-800	0.19
BY223	1.25
BY224-600	2.60
BY226	0.15
BY227	0.20
BY228	0.60
BY229-1000	1.12
BY229-600	1.20
BY255	0.13
BY295-600	1.23
BY298	0.20
BY299	0.60
BY407	0.90
BY409	1.49
BY448	1.40
BY713	1.12
BYW56	0.14
BYX55-600	0.23
BYX71-600	0.85
BYX71-350	0.88
BYY56	1.48
BZY93C30	1.86
C106D	0.37
C106M	0.76
CA3046	1.55
CA3089	0.83
CA3090AQ	3.25
CA3094	2.20
CA3131EM	2.95
CD4001	0.24
CD4002	0.27
CD4008	1.35
CD4011	0.20
CD4012	0.24
CD4013	0.33
CD4016	0.25
CD4017	0.40
CD4020	0.75
CD4021	0.39
CD4023	0.28
CD4025	0.64
CD4028	0.84
CD4040B	0.45
CD4047	1.06
CD4049	0.24
CD4052	0.33
CD4066	0.23
CD4069	0.29
CD4070	0.25
CD4081	0.14
CD4093	0.40
CD4511	1.10
CD4526	0.37
CD4556	1.47
CR02AM-8	1.70
CV12E	4.62
CX095D	3.14
CX104	8.77
CX108	12.48
CX109	7.20
CX130	8.76
CX134	4.50
CX136	11.49
CX139	11.83
CX157	5.52
CX158	10.45
CX177	8.80
CX187	5.26
CX755	12.95
CX865A	6.85
E1222	0.40
E5024	0.23
E5386	0.25
GD243	1.95
GP758	0.84
HA11215	1.75
HA11211	2.53
HA11225	4.29
HA11229	3.46
HA11235	1.95
HA11124	5.25
HA11125	4.15
HA1137W	1.38
HA1138	3.75
HA11414	4.20
HA1156	1.16
HA11160	5.79
HA1166X	6.60
HA11167	6.60
HA11706	3.61
HA11705	8.00
HA11703	3.45
HA11701	3.57
HA11710	3.45
HA11713	2.90
HA11711	3.10
HA11714	7.76
HA11716	13.10
HA11725	18.26
HA11725MP	16.00
HA117555P	6.23
HA11781	21.15
HA11780	5.15

HA1196	7.43
HA13001	1.73
HA1306	2.26
HA13402	6.50
HA13342	2.65
HA13365	4.02
HA1366WR	2.17
HA1367	2.75
HA1368R	1.95
HA1368	2.65
HA1370	3.71
HA1374	1.80
AA117	9
HA1377	1.95
HA1389R	2.05
HA1369	2.39
HA1392	2.22
HA1394	2.37
HA1397	2.75
HA1398	2.75
HA1406	2.07
HA1452	0.85
HD14538	2.07
HD38702-A2	7.95
HD38750A53	5.77
HD38750A-7	7.25
HD38800A50	14.09
HD44801A05	12.50
HISH1010	14.60
HISH1004	6.00
HISH1002	9.50
HM6231	9.50
HM6732	7.20
HM6251	5.69
HM7103	4.85
HM8032	4.00
HM9012	3.22
HM9015	3.24
HT4207	13.25
HT4208	20.65
KA2101	1.00
KC581C	7.75
KC582C	4.85
L200CV	1.69
LA1201	0.75
LA1210	1.56
LA1230	1.18
LA1320	2.87
LA1357N	9.00
LA1363	1.25
LA1364	3.02
LA1365J	1.45
LA1385	1.53
LA1387	5.95
LA3350	1.43
LA3361	1.60
LA3390	5.52
LA4032P	2.35
LA4100	1.25
LA4101	1.30
LA4102	0.75
LA4112	0.86
LA4125	2.25
LA4138	4.98
LA4140	0.70
LA4192	1.50
LA4220	1.25
LA4420	1.72
LA4422	1.00
LA4430	2.88
LA4440	2.50
LA4445	1.80
LA4460	1.50
LA4461	1.60
LA5112N	1.18
LA7020	13.86
LA7025	11.97
LA7027	10.92
LA7040	9.20
LA7042	3.90
LA7800	1.30
LA7801	3.21
LB1274	3.61
LC7800	9.20
LD3120	1.13
LD3150	2.75
LM1017N	1.81
LM1877	2.95
LM2806	5.94
LM2877	7.45
LM317/CKC	1.08
LM324N	0.98
LM339N	0.41
LM340K	11.95
LM348N	2.15
LM380N	1.50
LM567CN	1.71
LM6402/011	10.23
LM6402A093	10.15
LM748	0.69
LM3360	3.87
LM3861	2.95
LR3419	9.37
LR3471	9.37
LU1141	7.27
LU52012	5.95
LU52011	14.95
LU03112	12.37
M193	6.83
M21C	1.10
M23C	1.98
M293	6.71
M51102L	2.77
M5115P	3.15
M51203L	5.18
M51231P	0.95
M5134-9341	4.13
M51353P	5.25
M51381P	5.98
M51393AP	4.50
M51394P	14.50
M5142P	6.85
M5144P	4.27
M51513L	2.55
M51515BL	2.75
M51517L	2.90
M5192	3.13
M5194AP	5.74
M5231L	1.58
M53274P	1.33
M54532P	1.50
M54544L	2.97
M58478P	6.75
M58485P	14.05
MA06	1.07
MA8001	1.82
MA8003	1.16
MB3712	1.85
MB3713	1.69
MB3730	1.75
MC13002	3.86
MC1310P	1.95
MC1327P	1.33

MC1330P	1.98
MC1350P	0.45
MC1351P	1.25
MC1352P	1.40
MC1357P	2.15
MC1358P	1.48
MC14493P	5.50
MC14494P	2.15
MC14497	5.94
MC14510BAL	3.75
MC14511BCP	1.10
MC14528BCP	2.15
MC1712	3.88
MC5192	19.50
MC7724CP	3.49
MCR106-5/6	1.23
MCR220/7	2.28
ME0411	0.75
ME6002	0.26
ME6102	0.28
ME8001	0.34
ME0411	0.75
MJ2501	3.30
MJ3001	1.43
MJ481	1.53
MJE2955	3.30
MJE3055	1.25
MJE340	0.49
MJE520	0.49
ML231	0.99
ML232B	3.01
ML237B	1.95
ML238	5.77
ML923	3.10
ML926	3.58
MM5314N	8.99
MM5316N	3.50
MM5318N	3.11
MM5369N	9.07
MM5387AA/N	6.20
MM5841N	6.64
MN1400VL	13.65
MN1405	7.92
MN1435VX	9.50
MP1192	5.07
MP2794	4.00
MP2812	5.07
MP8512	1.57
MPC596	2.13
MPF256C	0.60
MPS6570	0.48
MPSA42	0.15
MPSA56	0.08
MPSA92	0.30
MPSU05	0.86
MPSU10	1.70
MPSU56	0.60
MPSU60	1.33
MR818	0.33
MR854	0.50
MR914	1.20
MSM5816RS	17.35
MSM5840H	14.45
MVS460-02	0.34
NE542	2.75
NE555	0.19
NE556	0.65
NP1106	11.51
OA202	0.11
OA47	0.16
OA91	0.14
OA95	0.09
OC28	2.52
OC29	2.15
OC36	7.53
OC44	1.95
OC45	0.18
OC72	0.44
OC75	0.44
ON236	1.06
ON782	1.65
OT121	1.45
PT6042	3.25
PT8504	5.13
R1038	2.19
R1039	2.19
R2008B	1.33
R2009	1.98
R2010B	2.98
R2029	1.33
R2030	1.33
R2257	2.35
R2265	1.49
R2305	1.18
R2322	0.67
R2323	0.76
R2354A	0.64
R2354B	2.01
R2443	1.36
R2461	1.50
R2540	1.91
R2540X	3.30
R2615	0.67
RCA2060	2.00
RGP01-15	0.70
RGP10	0.23
RGP30M	0.28
RT402	1.58
SP35384	3.28
S1299	5.34
S2800D	1.50
S2802	2.90
S2818	4.05
S3702S	5.21
S40W	13.10
S6080B	9.98
SA8063	5.17
SAA1006	1.85
SAA1020	4.76
SAA1025	4.40
SAA1024	2.50
SAA1075	4.25
SAA1121	7.44
SAA1124	2.60
SAA1130	6.69
SAA1174	7.77
SAA1250	3.95
SAA1251	3.20
SAA1350	8.11
SAA3027P	2.71
SAA5000	3.25
SAA5010	3.50
SAA5012	5.50
SAA5020	5.78
SAA5030	6.33
SAA5050	4.90
SAB1009B	5.98
SAB3011	7.34
SAB3013	4.37
SAB3021	3.95
SAB3024	6.36
SAB3209	5.82
SAB3210	3.21
SAF1032P	3.58
SAF1039	1.95
SAS5010	8.39
SAS560S	1.91

SAS560T	5.42
SAS570T	5.42
SAS570S	1.95
SAS580	2.85
SAS6600	1.33
SAS660	1.33
SAS670	1.33
SAS6710	2.21
SBA750	1.61
SC84203	19.35
SC9504P	1.95
SDA2006	17.10
SDA2112/2	9.20
SG264A	5.26
SG613	10.71
SG629	8.27
SG6533	9.00
SI1125H	7.50
SI1630HD	20.50
SKE2F1/04	1.39
SKE2G3/04	0.85
SKE4F1/06	0.30
SKE4F2/08	1.07
SKE4F2/06	0.80
SKE4F2/10	1.33
SKE4G2/02	0.96
SKE5F3/10	1.36
SKS1/10	2.15
SL1310	3.14
SL1430T	2.31
SL414	3.69
SL432A	3.44
SL433	2.48
SL471	2.13
SL480	3.14
SL490	2.37
SL901B	8.32
SL918A	9.07
SN16861AN0	0.82
SN16862AN	2.98
SN16966N	10.25
SN29717N	7.19
SN29716N	3.66
SN29715N	6.04
SN29722	11.95
SN29723AN	8.77
SN29764AN	2.60
SN29767	3.90
SN29770BN	3.69
SN29772BN	5.75
SN29771BN	5.59
SN29781	1.67
SN29798N	5.56
SN2709	0.44
SN7400N	0.61
SN7401N	0.36
SN7402N	0.65
SN7404N	0.52
SN7408N	0.27
SN7410N	0.27
SN74121	1.60
SN7413N	0.37
SN74141N	2.65
SN74151AN	1.51
SN74154N	1.27
SN74190	1.35
SN7420N	0.34
SN7430	0.49
SN7440N	0.27
SN7472	1.54
SN7474N	0.44
SN7490AN	0.75
SN74LS26N	1.45
SN76001N	1.65
SN76013ND	3.50
SN76023N	2.97
SN76023ND	3.91
SN76033N	5.54
SN76110N	0.90
SN76115AN	1.61
SN76131	0.82
SN76227N	2.45
SN76226DN	2.98
SN76229N	3.27
SN76242	5.23
SN76243	5.23
SN76396	2.90
SN76533N	2.47
SN76532N	0.91
SN76545	4.87
SN76546N	3.47
SN76549	2.45
SN76570	3.08
SN76611	2.59
SN76620	2.59
SN76660N	2.48
SN76666N	1.20
SN76708	4.86
SN76709N	9.63
SN76707N	1.23
SN76705N	2.97
SN76730	5.54
SN76810N	0.60
SN76832N	1.35
SN94041	5.54
SN94042	4.35
SP35384	1.98
ST1702L	0.99
STA401	2.49
STA441C	3.10
STA471C	8.70
STK0029	9.55
STK0050	7.85
STK016	6.91
STK022	8.95
STK031	12.95
STK040	13.34
STK054	9.35
STK058	27.50
STK077	9.28
STK1039	5.75
STK2110	7.33
STK2145	16.95
STK2240	16.65
STK2250	18.95
STK3042	5.63
STK3044	5.75
STK4019	9.29
STK433	4.78
STK4332	4.75
STK435	7.12
STK4352	1.95
STK436	5.95
STK437	6.50
STK4372	13.13
STK460	8.74
STK466	10.10
STK4833	9.52
STK501	6.32
STK502	7.25
STK5314	11.50
STK5730	3.20
STK7216	14.90
STK772	3.71

STR1096	11.20
STR4090	9.50
STR440	5.77
STR451	5.77
STR453	8.16
STR454	13.35
STR6020	6.96
T6029V	7.98
T6035V	0.73
T6036	0.67
T6037	2.11
T6044V	0.97
T6045	1.20
T6049	1.45
T6052V	0.87
T6058	3.08
T6059	4.22
T9003V	1.25
T9005V	2.38
T9011V	1.40
T9013V	4.95
T9014V	2.42
T9016	1.02
T9019W	1.98
T9034V	1.45
T9035V	6.65
T9051	7.70
T9054V	6.43
T9057V	2.77
T9062V	0.49
T9064	4.20
TA7027	4.80
TA7050	1.74
TA7051	1.74
TA7054	2.55
TA7060AP	0.71
TA7061AP	1.27
TA7069	3.13
TA7070P	1.83
TA7072P	2.57
TA7074P	1.98
TA7076P	7.50
TA7089P	3.10
TA7092P	9.94
TA7093P	3.99
TA7102P	5.98
TA7108P	1.61
TA7109	3.71
TA7122B/P	0.87
TA7124P	2.34
TA7129P	1.90
TA7130P	1.27
TA7136AP	1.89
TA7137P	0.98
TA7141AP	3.87
TA7146P	7.83
TA7148P	1.67
TA7149P	3.26
TA7152P	2.98
TA7161P	4.50
TA7162P	3.61
TA7172P	1.41
TA7176P	1.75
TA7193P	4.80
TA7204P	1.95
TA7205P	12.49
TA7207P	1.48
TA7208P	2.15
TA7210P	1.45
TA7214P	3.63
TA7215P	2.58
TA7217AP	1.45
TA7222	1.85
TA7226	3.57
TA7229P	4.66
TA7230P	1.35
TA7233P	3.61
TA7240AP	2.55
TA7243P	1.95
TA7310P	2.15
TA7313AP	0.65
TA7314	3.50
TA7323P	3.15
TA7325P	1.15
TA7339P	1.85
TA7340P	5.95
TA7607AP	1.30
TA7609	2.25
TA7611AP	3.32
TA7616P	5.25
TA7622AP	8.94
TA7628P	1.40
TA7629P	7.50
TA7630P	0.95
TA7640AP	2.40
TA7672P	2.75
TA7676P	2.81
TA7726P	10.25
TAA320A	1.27
TAA350A	0.80
TAA570	1.65
TAA621AX1	4.85
TAA661B	0.95
TAA691	8.58
TAA700	2.37
TAA930	4.87
TAA970	2.83
TAG626-600	1.20
TBA120AS	1.45
TBA120SB	0.40
TBA120T	1.75
TBA120U	2.50
TBA120A	1.05
TBA1440	1.94
TBA1441	1.95
TBA395	1.30
TBA396	1.20
TBA400	2.39
TBA440C	2.34
TBA4800	1.30
TBA510	1.37
TBA520	1.20
TBA530	1.30
TBA540	1.72
TBA560C	1.40
TBA5700	1.60
TBA570A	1.71
TBA673	2.60
TBA700	1.85
TBA720	2.95
TBA730	3.55
TBA7500	2.50
TBA760	1.71
TBA800	1.08
TBA810S	1.61
TBA810T	1.75
TBA820	0.66
TBA820M	0.82
TBA890	3.30
TBA920	1.65
TBA940	1.87
TBA950	1.55

TBA970	3.60
TBA990	1.98
TCA270S	2.15
TCA270SQ	1.05
TCA290A	2.39
TCA420A	2.15
TCA440	2.25
TCA530	2.24
TCA640	2.25
TCA650	3.05
TCA660B	2.60
TCA730	2.75
TCA750	2.25
TCA800Q	1.60
TCA830S	2.38
TCA890	5.44
TCA900	2.04
TCA910	1.65
TCA940	0.82
TCA940E	2.93
TD3F800R	4.78
TD3F900H	5.36
TDA1001B	2.31
TDA1003A	3.16
TDA1005A	2.22
TDA1006A	7.00
TDA1010AF	4.25
TDA1011	1.14
TDA1010	1.05
TDA1011A	1.51
TDA1028	2.45
TDA1034B	2.42
TDA1035S	2.95
TDA1035T	1.85
TDA1037	1.60
TDA1037D	2.05
TDA1044	2.10
TDA1047	3.25
TDA1059B	0.80
TDA1054M	1.21
TDA1060	2.60
TDA1082	3.25
TDA1151	0.95
TDA1190	1.27
TDA1190Z	2.48
TDA1200	1.51
TDA1235	3.88
TDA1236	4.30
TDA1270	3.74
TDA1327A	6.93
TDA1412	1.08
TDA1420	1.52
TDA1440	3.45
TDA1470	2.90
TDA1470P	4.25
TDA1506	5.74
TDA1510	4.60
TDA1512	2.89
TDA1515	2.55
TDA1559	3.15
TDA1670	4.48
TDA1770	2.88
TDA1905	1.27
TDA1908	2.55
TDA1940	5.20
TDA1950	2.50
TDA2005	1.30
TDA2006	1.35
TDA2004	0.99
TDA2002	0.90
TDA2003	1.00
TDA2030	1.05
TDA2140	2.14
TDA2150	6.20
TDA2151	1.30
TDA2160	4.01
TDA2161	5.11
TDA2170	4.75
TDA2270	2.50
TDA2520	2.25
TDA2522	11.20
TDA2524	4.50
TDA2525	5.58
TDA2532	2.50
TDA2530	2.20
TDA2541	1.00
TDA2540	1.95
TDA2545Q	5.94
TDA2560	2.50
TDA2575A	0.50
TDA2578A	2.95
TDA2576A + Kit	12.35
TDA2581	1.60
TDA2582	1.35
TDA2591	2.15
TDA2594	3.40
TDA2593	3.40
TDA2595	3.84
TDA2600	7.00
TDA2611AQ	2.89
TDA2612Q	4.68
TDA2611A	1.25
TDA2610	2.79
TDA2620	1.96
TDA2630	2.50
TDA2631	2.73
TDA2640	3.80
TDA2652	8.62
TDA2653	3.16
TDA2654	4.73
TDA2670	2.48
TDA2680	3.20
TDA2740	10.14
TDA2780AQ	8.84
TDA2795	2.78
TDA2791	1.81
TDA2910	13.25
TDA3300B	6.98
TDA3330	3.26
TDA3506	4.40
TDA3501	5.50
TDA3500	4.25
TDA3510	5.95
TDA3520	9.71
TDA3540	2.20
TDA3541	2.22
TDA3560	5.83
TDA3571Q	3.63
TDA3576	7.46
TDA3590	6.79
TDA3591	6.45
TDA3650	6.93
TDA3652	2.60
TDA3651AQ	3.95
TDA3651	2.45
TDA3651A	2.50
TDA3950	4.50
TDA4050B	3.40
TDA4280	7.20
TDA4290	1.95
TDA4400	4.90
TDA4420	2.30
TDA4422	8.32
TDA4427S	9.00
TDA4431	2.27

TDA4440	1.95
TDA4442	4.15
TDA4500	4.75
TDA4600-2	1.75
TDA4610	8.15
TDA4620	7.75
TDA5500	7.45
TDA5700	2.75
TDA7270S	2.25
TDA8190	3.92
TDA9403	3.70
TDA9503	2.32
TDA9513	3.15
TDB1033	2.68
TDE1081	7.24
TEA1002	2.30
TEA1009	0.80
TEA1014	3.00
TEA1020SP	4.93
TIC106C	0.61
TIC106M	0.77
TIC44	0.72
TIC45	0.55
TIC47	0.77
TIP120	1.55
TIP110	0.35
TIP112	0.45
TIP117	0.95
TIP121	0.40
TIP126	0.38
TIP132	0.99
TIP137	0.96
TIP29	0.84
TIP2955	0.86
TIP29A	0.46
TIP29B	0.63
TIP29C	0.40
TIP29D	0.75
TIP3055	0.66
TIP30A	0.41
TIP30C	0.40
TIP31A	0.34
TIP31B	0.38
TIP31C	0.30
TIP32A	0.35
TIP32B	0.46
TIP32C	0.28
TIP33	0.85
TIP33A	1.02
TIP33C	0.95
TIP34	0.75
TIP41A	0.36
TIP41B	0.31
TIP41C	0.60
TIP42A	0.39
TIP42B	0.79
TIP42C	0.50
TIP47	0.65
TIS43	1.13
TIS90	0.21
TL011CP	1.65
TL494CN	8.77
TLD72CP	1.45
TMP4320	15.00
TMS1024NLL	6.50
TMS1025N	11.95
TMS3720ANS	5.25
TMS3748NS	17.70
TMS3755	13.65
TMS3894NL	19.25
TMS5102NLL	6.25
TUA2000	8.98
TY6010B	2.97
ULN2204	8.50
UPA53C	4.94
UPC1003	5.95
UPC1009C	6.32
UPC1025H	2.90
UPC1028H	2.00
UPC1032H	0.82
UPC1042C	8.95
UPC1156H	3.94
UPC1161C	4.98
UPC1182H	2.06
UPC1186H	1.05
UPC1181H	1.35
UPC1185H	2.10
UPC1188	8.77
UPC1212C	0.80
UPC1225H	2.55
UPC1230	1.88
UPC1238	2.10
UPC1278H	5.95
UPC1351C	1.81
UPC1350C	1.40
UPC1353	1.63
UPC1355C	2.13
UPC1363	4.20
UPC1362	1.80
UPC1365C	2.50
UPC1366	1.65
UPC1360C	4.51
UPC1378H	1.95
UPC141C	4.95
UPC1458	2.00
UPC151C	2.95
UPC2002	1.48
UPC30C	2.51
UPC324C	4.70
UPC32C	4.95
UPC339C	4.35
UPC41C	2.99
UPC4558C	1.24
UPC474	5.11
UPC554C	1.85
UPC575C2	1.55
UPC580C	6.60
UPC587C2	1.34
UPC592H	2.15
UPC595	2.95
UPC596	1.98
UPD1514C	4.76
UPD2819C	4.98
UPD553-164	19.52
UPD8049C-1	11.50
X0022CE	5.75
X0029CE	7.09
X0031CE	6.32
X0035TA	6.18
X0040TA	4.50
X0042CE	4.35
X0043CE	2.75
X0056CE	6.25
X0057GE	6.00
X0065CE	5.77
X0074GE	15.29
X0077GE	14.60
X0079CE	4.95
X0096CE	6.20
X0109CE	11.25
X0195CE	9.48
X0195CE	9.60
X0204CE	8.74
X0261CE	8.98
ZPY120	3.25

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Machine Nos.: VCR7000 — **VHS R**
VCR4600 — **9VH4600**

FERGUSON/JVC
Machine Nos.: 3292 8903 3V00 3V01 3V06 3V16 3V22 3V23 3V24 3V29 3V30 3V31 3V35 3V36 3V38 3V39 3V49 — **VHS A**

FISHER
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GEC
Head Part Nos.: 5458161 5458165
Machine Nos.: 4000H 4001H 4002H — **VHS I**
Head Part Nos.: 5458282 5458413 5458415 5458992
Machine Nos.: 4001H 4004H — **VHS K**

HITACHI
Machine Nos.: VT3000 — **VHS A**
Head Part Nos.: 5458104
Machine Nos.: VT4000 VT4200 VT5000 VT5500 — **VHS H**
Head Part Nos.: 5458161 5458165
Machine Nos.: VT6500 VT7000 VT8000 VT8040 VT8100 VT8500 VT8700 VT9000 VT9300 VT9500 VT9700 VT9900 — **VHS I**

Head Part Nos.: 5458282 5458413 5458415 5458992
Machine Nos.: VT11 V14 VT33 VT34 VT330 VT340 VT5030 VTP10 VTP30 — **VHS K**

ITT
Machine Nos.: VR3605 VR3033 VR3905 VR3913 VR3914 VR3935 VR3943 VR3963 VR3993 VR3975 VR3985 VR3986 VR3833 — **VHS A**

JVC (see also Ferguson)
Machine Nos.: HP4000 HR2200 HR3300 HR3320 HR3330 HR3350 HR3360 HR3660 HR3750 HR3860 HR4100 HR7200 HR7600 HR7610 HRD110 HRD111 HRD120 HRD121 HRD140 HRD150 HRD220 HRD225 — **VHS A**

MITSUBISHI
Machine No.: HS200 — **VHS A**
HS700 HS303 HS304 — **VH700**

NATIONAL PANASONIC
Head Part Nos.: VEH0099 0103 0115 0121 0131
Machine Nos.: NV300 NV322 NV332 NV333 NV340 NV390 NV2000 NV3000 NV7000 NV7200 NV7500 NV7800 NV7850 NV8170 NV8200 NV8400 NV8600 NV8610 NV8620 — **VHS B**
Head Part Nos.: VEH0171 VEH0218
Machine No.: NV370 NV3708 — **VHS M**
Head Part Nos.: VEH0171
Machine No.: NV330 NV777 — **VHS N**
Head Part Nos.: VEH0286
Machine No.: NV430 — **VHS W**
Head Part Nos.: VEH0174
Machine No.: NV366 — **VHS X**

SHARP
Head Part Nos.: DDRMU 0002 HE17/21/27
Machine No.: VC581/2/3 651 681/2/3/5 659 699 — **VHS S**
Head Part Nos.: DDRMU 0001 HE00 0002 HE02 04 05 06
Machine No.: 2C9 VC110 VC200 VC220 VC300 VC381 VC384 VC386 VC387 VC388 VC477 VC481 VC482 VC930 VC970 VC3300 VC9100 VC9300 VC9400 VC9500 VC9600 VC9700 — **VHS C**
Head Part Nos.: DDRMU 0001 HE09
Machine No.: VC7300 VC7700 VC7750 — **VHS D**
Head Part Nos.: DDRMU 0001 HE10
Machine No.: VC6300 — **VHS E**
Head Part Nos.: DDRMU 0001 HE12
Machine No.: VC8300 — **VHS L**
Head Part Nos.: DDRMU 0001 HE14
Machine No.: VC2300 — **VHS F**

SANYO
Head Part Nos.: 1430242 T01700 1430242 T22300
Machine No.: VTC5000 VTC5150 VTC5300 VTC5400 — **BETA D**
Head Part Nos.: 1430242 T02200
Machine No.: VTC5350 VTC5500 — **BETA D**
Head Part Nos.: 1430762 T02000
Machine No.: VTC9300 VTC9455 VTC9500 — **BETA X**
Head Part Nos.: 143072 T02100
Machine No.: VTC9300PS VTC9350 — **BETA X**

SONY
Head Part Nos.: A6762 044A. 044B, 054A, 147A
Machine No.: SL3000, 8000, 8080, SLT 6Me, 7, 7E, 7ME — **BETA A**
Head Part Nos.: A6762 012A, 038A, 055A, 129A
Machine No.: SL5W. 5000 5100 SLC5, C6. C7 — **BETA B**
Head Part Nos.: A6762 072A, 122A, 136A, 139A, 213A
Machine No.: SLC20, C30, C33, C40, C44 SLF1. F30, HF72, T20, T30 — **BETA W**

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BETA B	£16.95
BETA D	£27.50
BETA E	£34.49
BETA T	£21.00
BETA W	£19.95
BETA X	£31.92
VHS VIDEO	
VHS A	£13.95
VHS B	£13.95
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VHS V	£29.00
VHS W	£21.95
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01X0 027 085	£46.02
01X0 033 825	£47.05
01X0 040 002	£48.32
01X0 056 013	£61.55
01X0 057 002	£31.36
01X0 082 001	£46.02
01X0 083 063	£66.03
PHILIPS	
310 274 44	POA
691 200 54	£49.68
691 200 98	£62.02
691 201 12	£61.66
691 201 66	£61.93
691 201 78	£49.96
691 202 87	£55.37

FERGUSON/JVC

VID1	01X0-003-381	Tension band T3292/PU545904A	2.55
VID2	01X0-018-024	Take up idler T3292/PU47752	5.00
VID3	01X0-018-025	Rewind idler assembly T3V16/PU49282	6.20
VID4	01X0-018-729	Take up idler T3V00/PU49280	6.95
VID5	01X0-040-006	Loading belt T3V29/30/PU48941-2	0.26
VID6	01X0-033-454	Roller Assy. (cass. Housing) T3V23/PU49042	4.50
VID7	01X0-040-007	Take up idler 3V29/30/PU48967B	2.90
VID8	01X0-040-017	Reel motor assembly 3V29/30/PU51381V	27.95
VID9	01X0-065-009	Capston motor 3V35/36/38/39/PU55371V	22.10
VID10	01X0-065-016	Cass. housing Assy. 3V35/36/38/39/PU29825	22.00

GEC/HITACHI

VID11	V5577355	GEC 4100/Hitachi VT11E capston motor	23.50
VID12	V6413663	GEC 4000/Hitachi VT33 f/f rewind arm	2.75
VID13	V6861471	GEC 4001/2/Hitachi 93/9500 f/f rewind arm	1.95
VID14	V6861482	GEC 4001/2/Hitachi 93/9500 play idler assy.	4.20
VID15	V6886971	GEC 4004/Hitachi VT33 f/f rewind arm	1.80
VID16	V2423461	ET541 Tuner Unit	6.00

NATIONAL PANASONIC

VID17	VXP0329	Fast forward idler NV2000	0.85
VID18	VXP0344	Idler NV7000/7200	0.85
VID19	VXZ0078	Tension Band NV7000	3.50
VID20	VXP0521	Idler NV370	2.65
VID21	VXP0463	Reel Idler NV777	3.40
VID22	VXP0432	Pinch Roller NV333	3.30
VID23	VXP0401	Idler wheel NV333	1.25

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SANYO/FISHER

VID24	4529V10800	Reel motor VTC5000/5150	9.50
VID25	1430662T01201	Reel drive pulley VTC 5000	4.95
VID26	PR2758	Pinch roller VTC5000/5150	3.85
VID27	1430490400900	Gear idler Fisher FVH-P615	4.50
VID28	1430420400300	Heart idler Fisher FVH-P615	2.95

SHARP

VID29	RMOTP1029	Capston motor 73/9300	33.55
VID30	RMOTV1008	Reel motor VC9700	17.95
VID31	NIDL0006	Idler VC387H etc	1.75
VID32	NIDL0005	Reel idler VC9300 etc	1.85
VID33	NIDL0004	Idler wheel VC2300	2.15

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VID34	LA9295	Universal lamp without socket 290mm	0.45
VID35	LA9210S	Universal lamp with socket 310mm	0.50
VID36	NAT/PAN.	P.C. MTG. leadless lamp	0.50
VID37	SHARP 9300	Etc. lamp plus plastic shroud.	2.53

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AKAI

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VP 68	DBK135	£0.86
VP 7100	DBK103	£1.42
VS 1	DBK134	£1.76
VS 2 EG	DBK101	£1.08
VS 3	DBK134	£1.76
VS 5 EG	DBK101	£0.68
VS 10	DBK136	£1.65
VS 9300	DBK103	£1.42
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A third, updated edition of the "Guide to World-wide Television Test Cards" is available from HS Publications, 7 Epping Close, Mackwoth Estate, Derby DE3 4HR. The price is £4·95 UK, £5·95 continental Europe and £7·25 by airmail world-wide.

Latest EBU Listings

At last there is an official listing of Remada RTT-1 (Tunisia), ch. E4. The location is 10E22 32N19 and the e.r.p. 40kW horizontal.

The following Danish stations are now listed:

Fyne (North)	E22	500kW	H	TV2	Svendborg	E43	1kW	H	L
Aarhus	E23	3kW	H	L	Jyderup	E48	600kW	H	TV2
Koebenhavn	E23	3kW	H	L	Odense	E49	3kW	H	L
Esbjerg	E23	0·5kW	V	L	Aalborg	E51	3kW	V	L
Naestved	E23	0·5kW	V	L	Koebenhavn	E53	600kW	H	TV2
Fyne (South)	E32	250kW	H	TV2	Neksoe	E53	1kW	V	L
Bramming	E33	500kW	H	TV2	Aarhus	E55	3kW	H	L
Aalborg	E35	600kW	H	TV2	Bornholm	E56	800kW	H	TV2
Vendsyssel	E37	50kW	H	TV2	Skive	E56	500kW	H	TV2
Holbaek	E37	0·2kW	V	L	Vendsyssel	E57	50kW	H	DR1
Roenne	E39	1kW	V	L	Koebenhavn	E60	3kW	H	L
Ringkoebing	E40	600kW	H	TV2	Fredericia	E60	0·2kW	V	L
Fejoe	E40	0·2kW	V	L					

H/V = horizontal/vertical. L = local station.

F2 Reception

A few words on this subject in view of the current interest. With increased sunspot activity there's greater likelihood of low-band v.h.f. signal reflection via the F2 layer, which during the day is at 200-220 miles above the Earth. Since reflection depends on the sun, it follows that for distant reception to be possible the sun must illuminate part of the signal path. The highest m.u.f. (maximum usable frequency) occurs at solar noon along the path. If, in the UK, an aerial is pointed to the east in good conditions during the early morning period, F2 reflection can provide ch. R1 signals from far into the USSR, a station clock showing a time four-five hours ahead of GMT. Towards midday more southerly signals will be received, e.g. ZTV (Zimbabwe) ch. E2. Towards mid-afternoon ch. A2 signals from N. America may be received.

Multiple-hop propagation is common via the F2 layer, so that signals may be received in the UK from as far away as Australia. Unfortunately with this type of propagation you get multiple images that are smeary and lacking in detail, making identification difficult at times.

The aerial should be mounted as high as possible, for horizontal polarisation. F2 signals often appear out of a noisy screen from nil to quite strong in a relatively short time, as brief as a minute. Openings can last from half an hour to five hours.

Towards dusk the F1 and F2 layers tend to merge and the m.u.f. can rise to say fifty per cent above the daytime level. This is known as transequatorial skip (TE) propagation and will give reception from the south (in the northern hemisphere).

Be sure to send in reports of any exotic reception!

The Late Roy Allen

I first met Roy Allen in 1963, when I was just starting with DX-TV reception. At that time he lived at Christchurch, Hants. He was particularly interested in reception of low-power stations such as Channel and the RTF outlets along the French coast, and in later years his interest spread to local radio stations. Roy subsequently moved to Bristol and became more active with radio. He was a true enthusiast and was one of the pioneers of DX-TV in the UK. Roy fought a brave fight against illness and is now at peace. Farewell, old friend.

VCR Tips

Dave Mackrill

Here are a few tips for those who regularly service VCRs, especially the older types.

Obtain the following: an ink rubber, some pipe cleaners, a hard toothbrush, a sheet of very fine wet-and-dry paper (marked "00 FLOUR") and, from the car accessory shop, a rubber car mat approximately 20 × 27in. for the bench – mine has ⅝in. squares, which hold all the screws, circlips etc. as they are removed from the machine. Don't forget some cheap, odd shapes of chamois leather for tape path cleaning and, of course, isopropyl alchohol from the chemist. The latter is sometimes called Isopropanol, which seems to be cheaper.

How do you remove those very stubborn tape oxide deposits from capstan shafts, and ground-in rubber from capstan motor pulleys, without taking ages, using half a bottle of alcohol, or scratching the surface? Simple. Use a hard ink rubber in the same way that we used to clean car rotor arms and distributor cap electrodes. Then, for the final deposits and a polish, use a fibre pencil such as the one available from SEME.

I usually remove the clamp to the capstan flywheel and withdraw it, making sure not to loose the oil seal washer that sits between the flywheel and its bottom bush. This gives easier access to both the shaft and the motor pulley. First however I remove the pressure roller and capstan shaft oil seal washer, plus oil pad washer if present, from the top of the deck. It's a good idea to lay an A4 sheet of paper on the bench mat, under the capstan bush, to catch the drops of oil. Then I run a pipe cleaner dipped in alcohol through the bushes, followed by one soaked in oil. This can be kept in a plastic bag, folded and taped to accommodate it, which will contain any excess oil.

The milled friction surfaces of reel tables, motor pulleys and certain Hitachi reel idlers should be scrubbed with the toothbrush after dipping it in alcohol.

If the pressure roller is to be reused, the glaze can be carefully removed using very fine wet-and-dry. Then clean with either soapy water or paraffin then water, followed by thorough drying. Alcohol and methylated spirit are too volatile for use with rubber items – they have a high evaporation rate which can cause cracks in the surface. I still use something called "video fluid", which used to be sold by SEME and is most suitable.

TEST CASE

325

Each month we provide an interesting case of TV/video servicing to exercise your ingenuity. These are not trick questions but are based on actual practical faults.

A camcorder's viewfinder is a tiny monochrome monitor that uses the same building blocks as a conventional TV set or monitor. So the story about to be told is applicable to any TV set – and you wouldn't need specific service data to be able to solve it! Our customer phoned to say that the picture produced by the viewfinder of his Sharp VL-C73 camcorder was blurred. Sliding the lens didn't help, neither did adjustment of the preset focus potentiometer. When the camcorder was brought into the workshop we found that the image on the screen was just a defocused blob. It filled the screen vertically but the horizontal scan fell short. Something was very wrong! Otherwise, the camcorder worked perfectly.

We dug into the viewfinder and found a tiny but perfectly conventional line output stage. It has a sugar-cube sized line output transformer that contains the e.h.t. rectifier. Other supplies derived from the transformer are a 450V boost line that feeds a resistive chain to provide operating voltages for the tube's electrodes, a negative line for the video output stage and to provide grid bias for the c.r.t., and a winding to feed the flea-power c.r.t. heater. Testing started in this area, the first check being on the supply to the line output stage. It was correct at 5V. The 450V boost supply was low at 225V however. Ohmmeter tests showed that the rectifier diode D706 and the resistive chain (total 5MΩ) were o.k., but to be sure we disconnected the diode and checked the input pulse with a scope. The pulses had an amplitude of about 230V, which suggested that the trouble wasn't due to overloading. They were of a strange shape however.

The technician next checked the pulse at the collector of the line output transistor Q704. No pulse amplitude figure is quoted in the service manual, but the fact that the pulses were of 55V peak-to-peak amplitude seemed reasonable in view of the 5V supply to the stage. Again however the pulses had a somewhat peculiar shape – they had slight shoulders. The technician decided to check the duration of the flyback pulses: he adjusted the scope's timebase setting and found that they were of 6μsec duration, well short of the expected 11-12μsec.

Now a too narrow line flyback pulse usually suggests that there's something wrong with the tuning of the line output stage. The *LC* circuit consists of the line output transistor's inductive load and the tuning capacitor, in this case C719. After checking the capacitor by substitution, our man became convinced that the transformer was at fault – with shorted turns maybe, or perhaps something was wrong with an internal diode. Be that as it may, a new one was ordered. It was fitted with care but the result was the same distorted blur as before on the screen. The waveforms and voltages were also pretty well as before. Nought out of ten for diagnostic skill – and great consternation on the part of the owner who, typically, wanted it this Saturday for a wedding.

Back into the little beastie with the scope then, this time to check the line drive waveform. It was good and square at the line driver transistor, and the coupling capacitor was o.k. The electrolytic capacitor that provides coupling to the line scan coils was also all right. A substitute efficiency diode and line output transistor did nought to help matters.

A while later the technician was kicking himself. If only he'd looked more closely at his scope! – or brought in another test instrument. So what was the cause of the trouble? See next month for the answer.

ANSWER TO TEST CASE 324
– page 136 last month –

No, a new luminance drive chip didn't cure the problem with the Hitachi VT33 VCR. You'll remember that it wouldn't record a picture, though the E-E picture was fine.

Really, there should have been no great surprise: there was a fundamental flaw in John's reasoning as he attempted to diagnose the cause of the trouble. The value of the coupling capacitor C248 at pin 28 of the chip is 0·022μF. At the vision carrier frequency (4MHz) its reactance would be about 2Ω. To drop a 4MHz signal across 2Ω you'd need very high power from a driver stage with a very low output impedance – and that's no description of Q201 and its associated components! Plainly C248 had gone open-circuit, leaving the luminance-plus-chrominance signal at the collector of Q201 to "walk the plank". Shunting another capacitor across C248 restored normal writing current and good recordings were then made. The original capacitor measured but a few puffs on Television Ted's 1954 capacitance bridge.

The inevitable customer relations problem followed the technical one. It was left to Sage to sort out – "it's his bloody job", as John rightly said. The estimate had been made on the basis of replacing the reel idler, but the prolonged sortie into the luminance recording department had more than doubled the bill even without the cost of the chip being charged. Not to worry said the customer. He never used the machine for recording – there was no aerial point in his bedroom where he used it for playback only . . .

QUERY SERVICE CLOSED

See note on page 189.

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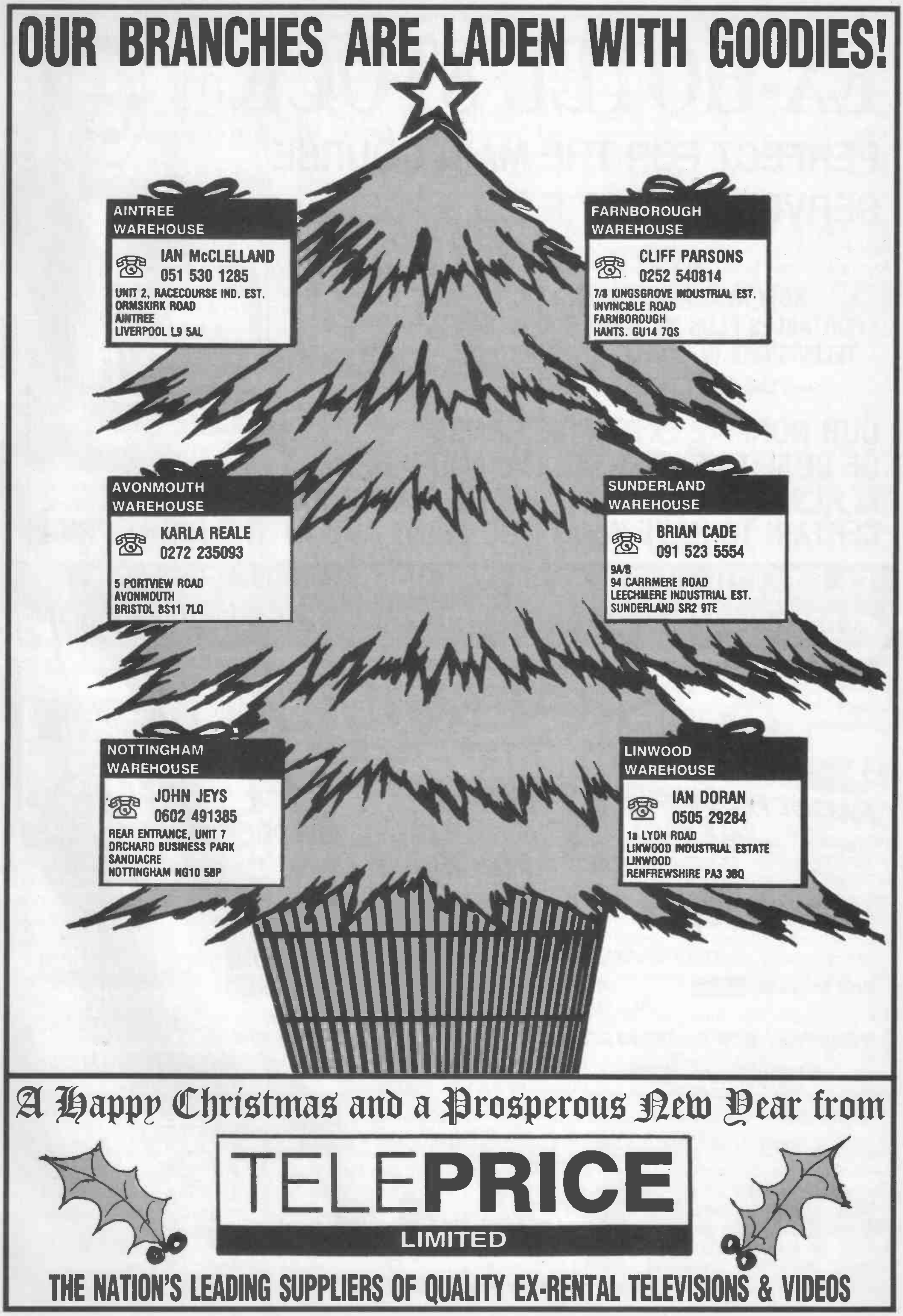
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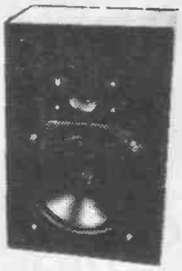

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Supplied with:— 2 READY CUT BAFFLES, ALL CROSSOVER COMPONENTS, 2 BASS MID-RANGE, 2 DOME TWEETERS, HOOK UP WIRE, GRILLE CLOTH, SCREW TERMINALS AND SCREWS.

CROSSOVER KIT. To build 2 sets of crossovers **£11+£1.75** post. (Featured in *Everyday Electronics*–May 1989 issue). Reprint Free with Kits.

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125 watt per channel stereo power amplifier with independent volume controls, professional 19" rack mount and silent running cooling fan for extra reliability.

Output power .... 125W RMS max. per channel
Output impedance .... 4 to 16 ohms (max. power into 4 ohms)
Sensitivity .... 450V at 22K ohms
Protection .... Electronic short-circuit and fuses
Power .... 220-240V a.c. 50Hz
Chassis dim .... 435×125×280mm

£124.99+£7.00 p&p

GOODMANS 60W CAR GRAPHIC

As new condition but have been returned by customers or shops, so they may need some attention. Hence the price of only £8.00 each. Order six of these units and you get the seventh one free. Postage £2.90

LCD DIGITAL MULTI TEST METER AC DC

Volts resistance and DC Amps. Most of these units are new but have been returned or rejected by the store and sold with all faults at £11.00 each. Postage £1.00. (Made by Ross Electronics).

ROSS DYNAMIC MICROPHONE BALL TYPE

General purpose in light weight case with wire mesh grill, and on/off switch fitted with lead and jack plug. These units have been returned and may need repairing. Price £2.50 each. Order ten of these units and you get one free. Postage 80p.

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BP015B	1	30 watt, dome tweeter. Size 90×66mil *JAPAN made*
BP016	6	2200µf can type Electrolytic 25V d.c computer grade *made in UK by PHILIPS*
BP017	3	33000µf 16V d.c. electrolytic high quality computer grade *UK made*
BP018	3	2000µf 50V d.c. electrolytic high quality computer grade *made in USA*
BP019	20	20 ceramic trimmers
BP020	4	Tuning capacitors, 2 gang dielectric a.m. type
BP021	10	3 position, 8 tag slide switch 3 amp rated 125V a.c. *made in USA*
BP022	5	Push-button switches, push on push off, 2 pole change over. PC mount *JAPAN made*
BP023	6	2 pole 2 way rotary switch
BP024	2	Right angle, PCB mounting rotary switch, 4 pole, 3 way rotary switch *UK made by LORLIN*
BP025	4	3 pole, 3 way miniature rotary switch with one extra position off (open frame YAXLEY type)
BP026	4	4 pole, 2 way rotary switch *UK made by LORLIN*
BP027	30	Mixed control knobs
BP028	10	Slide potentiometers (popular values)
BP029	6	Stereo rotary potentiometers
BP030	2	100k wire wound double precision potentiometers *UK made*
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BP033	2	FM stereo decoder modules with diagram *UK made by PHILIPS*
BP033A	4	6"×⅜" High grade Ferrite rod. U.K. made.
BP034	3	AM IF modules with diagram UK made by PHILIPS
BP034A	2	AM-FM tuner head modules. *UK made by MULLARD*
BP034B	1	Hi-Fi stereo pre-amp module inputs for CD, tuner tape, magnetic cartridge with diagram. *UK made by MULLARD*
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BP036	6	Fuse holders, panel mounting 20mm type *JAPAN made*
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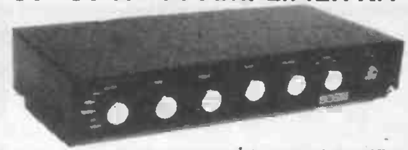

An easy to build amplifier with a good specification. All the components are mounted on the single P.C.B. which is already punched and backprinted.

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Size (H.W.D.) 75×400×195mm
Kit enclosed: case, P.C.B., all components, scale and knobs **£36.80.** post £3.50
(Featured project in *Everyday Electronics* April 1989 issue). Reprint Free with kit.

TV SOUND TUNER

In the cut-throat world of consumer electronics, one of the questions designers apparently ponder over is "Will anyone notice if we save money by chopping this out?" In the domestic TV set, one of the first casualties seems to be the sound quality. Small speakers and no tone controls are quite common and that really is quite sad, as the TV companies do their best to transmit the highest quality sound. Given this background a compact independent TV tuner that connects direct to your Hi-FI is a must for quality reproduction. The unit is mains operated. This TV SOUND TUNER offers full UHF coverage with 5 preselected tuning controls. It can also be used in conjunction with your video recorder.

£29.50 +£2,50 p&p

As above but with built-in stereo headphone amplifier for the hard of hearing

You can tune into the TV channel you want while still receiving the picture on your TV set. In fact it is rather like a second television, but without the screen. So that the ordinary TV can be placed for everyone to see, and the volume on it can be comfortable for others, while the sound tuner can be placed where you can control it. You will need to plug in one of your own listening aids such as headphones or an induction loop to hear the sound. The tuner is mains operated, has 5 pre-selected tuning controls and can be used in conjunction with a video recorder.

Size: 270×192×65mm. **£35.90** +£2.50 p&p

TV SOUND TUNER KIT £11.50+£1.30 P&P

All parts including Varicap tuner, mains transformer, PCB with IC's capacitors and coils etc., to build the unit illustrated above; without case and scale.

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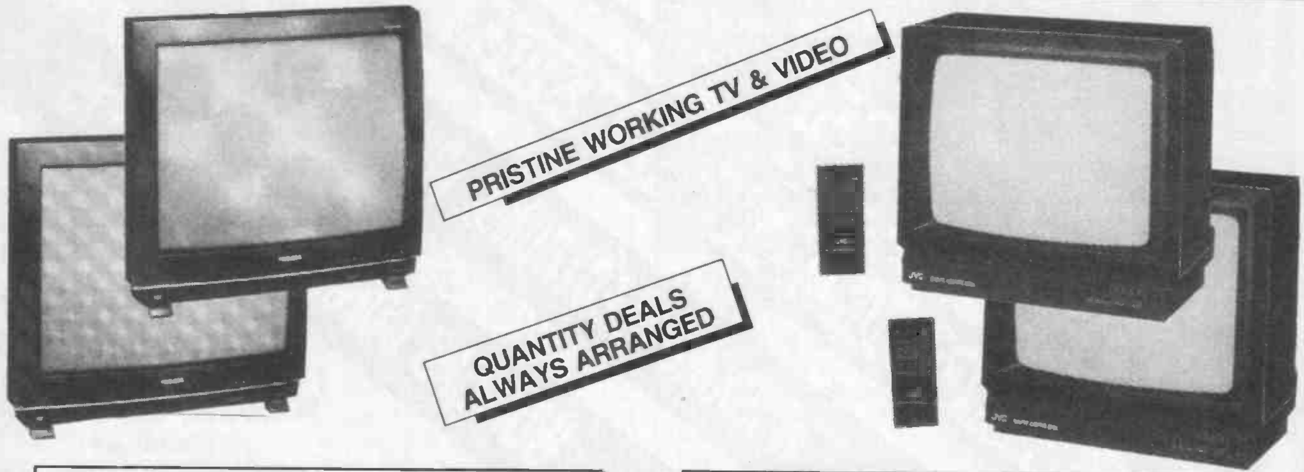

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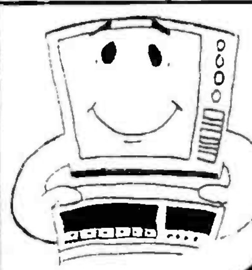

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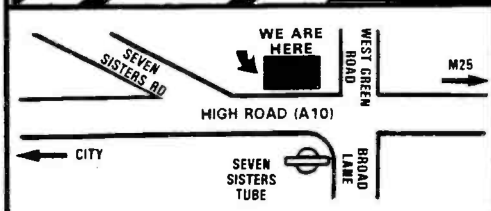

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UNIT 5, ROBLEY HOUSE
ORWELL ROAD,
KIRKDALE, LIVERPOOL 4

TELTECH

FAST VIDEO SPARES FAST

ALL STOCK ITEMS ARE DESPATCHED BY RETURN OF POST

VIDEO HEADS

REPLACEMENTS

All our replacement heads are brand new precision Japanese heads not refurbished.

Panasonic
- 3HSS(N) £16.00
  Fits model numbers: NV2000, NV2010, NV7000, NV7200, NV333, NV8600, NV8610.
- 3HSS-UI(N) £19.90
  Fits model numbers: NV370 & Philips VR6460.
- 3HSS(4N) £38.50
  Fits model number: NV366
- 3HSS(4NB) £38.50
  Fits model number: NV730

Ferguson
- 3HSS(V) £16.00
  Fits model numbers: 3V00, 3V16, 3V22, 3V29, 3V30, 3V31, 3V35, 3V36, 3V38, 3V39, HR2200 HR3300, HR3330, HR3360, HR7200, HR7300, HRD120, HRD130.
- 3HSS4VB £44.50
  Fits model numbers: 3V32.

Sharp
- 3HSS(SP) £26.50
  Fits model numbers: VC9100, VC9300, VC9500, VC9700, VC381, VC8381, VC383, VC388, VC482.

Toshiba
- PS3B(T) £26.50
  Fits model numbers: V9600, V31B, V33B.

Hitachi
- 3HSS(H) £26.50
  Fits model numbers: VT8000, VT9300 etc.

Sony
- PS3B(S) £19.95
  Fits model numbers: SLC5, SLC6, SLC7, SL3000 also various NEC models.
- P84B(2S) £26.50
  Fits model numbers: SLC20, SLC30, SLC40, SLF1.
- PS5B(3S) £44.20
  Fits model numbers: SLC9, SLT50, SLC8, SLF60.

Amstrad/Saisho
- 3HSS(R) £28.50
  Fits model numbers: VCR7000 and all models using Orion chassis.
- 3HSS(FI) £28.50
  Fits model numbers: VCR4500, VCR5200, VCR9000 etc.

Fisher/Fidelity
- 3HSS(SF) £29.90
  Fits model numbers: FVHP615, FVHP710, V1000.

GENUINE HEADS

Panasonic
- NV2000, NV2010 .... £44.00
- NV7000, NV7200 .... £44.00
- NV333, NV370 .... £44.00
- NV366 .... £64.50
- NV688, NV777, NV788 .... £64.50
- NV730 .... £67.50

All others available P.O.A.

Ferguson
- 3V00, 3V16, 3V22 .... £59.90
- 3V29, 3V30 .... £59.90
- 3V32 .... £66.90
- 3V35, 3V36, 3V38, 3V39 .... £59.90

Sharp
- VC7300, VC7700, VC7750 .... £69.90
- VC8300 .... £69.90
- VC9300, VC9500, VC9700 .... £62.00
- VC381, VC383, VC386 .... £62.00
- VC482 .... £62.00

All others available P.O.A.

Sanyo
- VTC5000, VTC5150 .... £39.90
- VTC5300, VTC5400 .... £39.90
- VTC9300 .... £39.90

Sony
- SLC5, SLC6, SLC7 .... £49.50
- SL8000, SL8080 .... £49.50
- SLC20, SLC30 .... £54.50
- SLC9 .... £54.50

Toshiba
- V9600 .... £59.90
- V8600 .... £69.90
- V31, V33 .... £59.90
- V55, V56 .... £59.90

Hitachi
- VT5000, VT5500 .... £49.50
- VT6500, VT8000, VT8300 .... £49.50
- VT8500, VT8700 .... £49.50
- VT9300, VT9500, VT9700 .... £49.50
- VT11E, VT14E £45.50
- VT17E, VT19E £54.60
- VT33E £49.50

Philips
- VR6460 .... £44.00
- VR6462, VR6467 .... £42.90

Please call if your model is not listed.

BELT KITS

GENUINE

Panasonic
- NV2000, NV2010 .... £6.50
- NV7000, NV7200 .... £6.50
- NV333, NV366 .... £6.50
- NV370, NV830, NV850 .... £2.80
- NV688 .... £6.50
- NV777, NV788 .... £4.70
- NV8600, NV8610 .... £6.50
- NV730 .... £1.90
- NV230, NV430, NV870 .... £3.20
- NV870, NV810 .... £2.80

Ferguson
- 3V00, 3V16, 3V22 .... £6.50
- 3V23 .... £3.90
- 3V29, 3V30 .... £4.90
- 3V35, 3V36, 3V38, 3V39 .... £2.90

Sanyo
- VTC5000, VTC5150 .... £1.99
- VTC5300, VTC5400 .... £4.50
- VTC9300 .... £6.50

Sony
- SLC5, SLC7 .... £6.50
- SLC6 .... £7.50
- SL8000, SL8080 .... £6.50

Sharp
- VC7300, VC7700, VC7750 .... £6.50
- VC8300 .... £6.50
- VC9100, VC9300, VC9500 .... £6.50
- VC381, VC383, VC386 .... £6.50

Hitachi
- VT5000, VT5500 .... £6.50
- VT8000, VT8300, VT8500 .... £2.90
- VT9300, VT9500, VT9700 .... £3.30
- VT11E, VT14E, VT17E, VT19 .... £6.50
- VT33E £6.50

Akai
- VS9700 .... £6.50
- VS2, VS3, VS4, VS5 .... £4.90
- VS9300, VS9500, VS9700 .... £6.50

Many others available

REPLACEMENTS

Panasonic
- NV2000, NV2010 .... £3.50
- NV7000, NV7200 .... £3.00
- NV333, NV366 .... £3.00
- NV8600, NV8610 .... £3.95

Ferguson
- 3V00, 3V16, 3V22 .... £3.50
- 3V23 .... £2.90
- 3V29, 3V30 .... £3.50
- 3V35, 3V36, 3V38, 3V39 .... £2.90

Sanyo
- VTC5000, VTC5150 .... £1.00
- VTC5300, VTC5400 .... £2.50
- VTC9300 .... £4.25

Sony
- SLC5, SLC7 .... £3.60
- SLC6 .... £4.95
- SL8000, SL8080 .... £4.25

Sharp
- VC7300, VC7700, VC7780 .... £3.50
- VC8300 .... £3.90
- VC9100, VC9300, VC9500 .... £3.90
- VC381, VC383, VC386 .... £3.90

Hitachi
- VT5000, VT5500 .... £4.50
- VT8000, VT8300, VT8500 .... £1.50
- VT9300, VT9500, VT9700 .... £1.50
- VT11E, VT14E, VT17E, VT19 .... £3.90
- VT33E £3.90

Akai
- VS9700 .... £3.90
- VS2, VS3, VS4, VS5 .... £3.95
- VS9300, VS9500, VS9800 .... £3.50

Many others available

SENSOR LAMPS
- All Panasonic £1.80
- All Ferguson/JVC £0.65
- Sharp VC9300 etc. £2.90
- Sharp VC7300 etc. £1.80
- Amstrad 7000 .... £2.30
- All Hitachi £1.80

SENSOR L.E.D.'s
- All Panasonic £2.90
- All Ferguson/JVC £2.90
- All Hitachi £5.75

END SENSORS
- Hitachi VT64E .... £1.20 each

REEL MOTORS
- Sharp VC9300, VC381 etc. £18.20
- Amstrad/Saisho etc. £18.20
- Panasonic NV333, NV366 .... £16.80
- Sanyo VTC5000, 5300, 5400 .... £9.90
- Panasonic NV7000, 7200 .... £19.80

DRUM MOTORS
- Ferguson/JVC 3V00, 3V22, etc. £29.90
- Sharp VC7300, VC7700 .... £26.40
- Sharp VC8300 .... £26.40
- Hitachi VT5000 .... £25.80

CAPSTAN MOTORS
- Sharp VC8300 .... £39.90
- Sharp VC7300, VC7700 .... £29.30
- Ferguson/JVC 3V00, 3V16, 3V22 .... £24.75
- Ferguson/JVC 3V29, 3V30 .... £34.50
- Ferguson/JVC 3V35, 3V36, etc. £25.80
- Hitachi VT5000 .... £25.80
- Hitachi VT8000, 8500, etc. £34.50
- Hitachi VT9300, 9500, etc. £34.50
- Hitachi VT11, VT14, VT17 .... £28.80
- Sony C5, C7 .... £42.90
- Akai VS1-VS5 .... £29.90

Many, many more!

CREDIT CARD ORDERS BY TELEPHONE RECEIVED BY 4 PM. ARE DESPATCHED SAME DAY

ACCESS

BARCLAYCARD VISA

LARGE RANGE OF REMOTE CONTROL'S FOR TV AND VIDEO

THIS MONTH'S SPECIALS

STK 5481 CHIP £5.80 PLUS VAT

HEADS

3HSS(V) FERGUSON & JVC
3V00 – 3V16 – 3V22
3V29 – 3V30 – 3V31
3V35 – 3V36 – 3V38 etc

3HSS (N) PANASONIC
NV2000 – NV2010 – NV3000
NV7000 – NV7200 – NV333

BOTH AT £14.50 + VAT
ADD 70p POST & PACKING

WE CARRY HUNDREDS OF VIDEO SPARES INC. PLAY IDLERS, CLUTCHES, MOTORS, SERVICE MANUALS, TENSION BANDS, BELTS AUDIO/CONTROL HEADS, ALIGNMENT TOOLS AND TAPES ETC.
SPECIAL ORDER FACILITIES
FOR NON-STOCK ITEMS

LARGE RANGE OF IC's & SEMI-CONDUCTORS AVAILABLE FOR TV, AUDIO & VIDEO

PINCH ROLLERS

Panasonic
- NV2000, NV2010, NV7000, NV7200 .... £4.95
- NV333, NV366, NV370, NV430 .... £4.95
- NV730 .... £7.95

Ferguson/JVC
- 3V00, 3V16, 3V22, 3V23 3V24 .... £4.95
- HR3300, HR3360, HR3660, HR2200 .... £4.95
- 3V29, 3V30, HR7200, HR7300 .... £4.95
- 3V35, 3V36, 3V38, 3V39 HRD120 .... £4.95

Sanyo
- VTC9100, VTC9300 .... £4.95
- VTC5000, VTC5150, VTC5300, VTC5400 .... £4.95

Sony
- SLC5, SLC7 .... £5.95
- SLC6 .... £5.95
- SL8000, SL8080 .... £5.95

Sharp
- VC7300, VC7700, VC7750 .... £4.95
- VC8300 .... £4.95
- VC9100, VC9300, VC9500 .... £4.95
- VC381, VC383, VC386 .... £4.95
- VC651 etc. £4.95

Hitachi
- VT5000, VT5500 .... £5.95
- VT8000, VT8300, VT8500 .... £4.95
- VT9300, VT9500, VT9700 .... £4.95
- VT11E, VT14E, VT17E, VT19 .... £4.95
- VT33E £5.95

Akai
- VS9700 .... £6.95
- VS2, VS3, VS4, VS5 .... £6.95
- VS9300, VS9500, VS9700 .... £4.95

IDLER WHEELS

Panasonic
- NV2000, NV2010 .... (Genuine) £2.90
- NV7000, NV7200 .... (Genuine) £2.90
- NV333, NV366 .... (Genuine) £2.90
- NV370, NV230, NV430 .... (Genuine) £4.50
- NV777, NV788 .... (Genuine) £4.50
- NV730 .... (Genuine) £4.50

Ferguson/JVC
- 3V00, 3V16, 3V22 (Large clutch) £5.95
- 3V00, 3V16, 3V22 (Small clutch) £6.95
- 3V29, 3V30, HR7200, HR7300 .... £3.90
- 3V35, 3V36, 3V38, 3V39, HRD120 .... £3.90

Sanyo
- VTC9100, VTC9300 .... £1.90
- VTC5000 Reel drive pulley £6.50
- VTCM10 Reel drive pulley £9.90

Sony
- SLC5, SLC7 .... Rewind kit £4.95
- SLC6 .... Rewind kit £4.95

Sharp
- VC9100, VC9300, VC9500 (Genuine) £3.90
- VC381, VC383, VC386 (Genuine) £3.90
- VC482, VC483, VC581 (also Saisho) (Genuine) £3.90
- VC482 etc. (Equivalent) £2.98
- VC9300, 381 etc. (Equivalent) £2.98

Hitachi
- VT8000, VT8300, VT8500 .... £4.72
- VT9300, VT9500, VT9700 .... £4.75
- VT11E, VT14E, VT17E, VT19 .... £3.96
- VT33, VT63, VT64, VT65 .... £3.96

Akai
- VS2, VS3, VS4, VS5 .... £4.50

Fisher
- FVHP615, FVHP710, FVHP725, etc. £6.90

We also carry all play idlers and clutches etc. for models listed plus many more.

TELEVIDEO SERVICES

UNIT 3, PLESSEY BUSINESS PARK, TECHNOLOGY DRIVE, BEESTON, NOTTINGHAM NG9 2ND

TEL: 0602-226070 FAX LINE: 0602-431097

24HR ANSWERING SERVICE FOR ORDERS PLACED AFTER 5.30 p.m.
Please add 70p post & packing and then add 15% VAT to total
OFFICIAL ORDERS ACCEPTED FROM SCHOOLS, COLLEGES, ETC. EXPORT ENQUIRIES WELCOME.
ALL PRICE ENQUIRIES SHOULD BE ACCOMPANIED BY STAMPED ADDRESSED ENVELOPE

AN3792	£2.95	AN7169	£2.95	HA11706	£3.75	LA4145	£1.70	PLL02A	£5.00	STK5211	£6.75	TA7609P	£2.70	BC516	£0.20
AN3821K	£5.95	AN7171K	£3.50	HA11710	£3.75	LA4160	£1.40	SAA1124	£2.50	STK5314	£6.75	TA7611AP	£2.20	BC517	£0.20
AN3822K	£6.95	AN7172K	£2.95	HA11711	£6.50	LA4170	£1.75	SAA5000	£1.95	STK5315	£6.75	TA7628P	£1.95	BC639	£0.22
AN5010	£2.95	AN7173K	£3.50	HA11713	£3.50	LA4178	£2.20	SAa5030	£3.50	STK5324	£5.75	TA7640AP	£1.30	BC640	£0.22
AN5011	£2.95	AN7178	£2.50	HA11714	£3.50	LA4180	£1.95	SAA5042	£8.00	STK5325	£5.75	TC9106BP	£4.95	BD243C	£0.50
AN5030	£3.75	AN7420	£1.95	HA11715	£3.50	LA4182	£1.95	STA301A	£3.95	STK5332	£3.50	TDA1010A	£1.40	BD244C	£0.50
AN5033	£5.95	AN7470	£2.20	HA11716	£4.75	LA4183	£2.20	STA401A	£3.50	STK5337	£7.25	TDA1011	£1.40	BFR90	£0.70
AN5071	£1.20	BA1335	£2.50	HA11717	£4.75	LA4190	£1.75	STA441C	£2.75	STK5338	£4.50	TDA1015	£1.50	BFR91	£1.20
AN5135K	£3.95	BA1355	£2.20	HA11718	£4.75	LA4192	£1.75	STK0029	£4.75	STK5421	£6.50	TDA1170N	£1.50	BF790	£0.50
AN5150	£5.50	BA5102A	£2.50	HA11724	£8.00	LA4201	£1.60	STK0039	£4.75	STK5422	£5.50	TDA11705	£1.50	BR756	£0.20
AN5151N	£6.50	BA5115	£2.50	HA11727	£8.50	LA4220	£1.50	STK0040	£6.25	STK5451	£5.30	TDA1506	£4.35	BU208A	£1.00
AN5256	£2.20	BA5204	£2.20	HA11736	£6.50	LA4260	£2.30	STK0049	£6.50	STK5471	£5.50	TDA1510	£3.60	BU208D	£1.00
AN5265	£1.75	BA5402A	£2.50	HA11744	£5.95	LA4261	£2.30	STK025	£8.50	STK5481	£5.95	TDA1510S1	£3.95	BU326A	£1.20
AN5410	£3.95	BA5406	£1.50	HA11745	£7.50	LA4270	£2.75	STK077	£6.95	STK5482	£5.95	TDA1515A	£2.50	BU406	£0.95
AN5411	£3.50	BA5408	£2.20	HA11745NT	£7.50	LA4280	£2.95	STK078	£6.95	STK5720	£4.25	TDA1522	£1.95	BU407	£0.70
AN5435	£2.20	BA6104	£2.20	HA11747A	£7.50	LA4420	£1.50	STK433	£5.25	STK5725	£4.25	TDA1770A	£2.95	BU408	£0.95
AN5436	£2.20	BA6109	£1.60	HA11747ANT	£7.50	LA4422	£1.50	STK435	£5.50	STK5730	£4.25	TDA2002	£0.80	BU426A	£0.80
AN5510	£2.75	BA6122	£2.20	HA11749	£4.25	LA4430	£1.50	STK437	£6.75	STK6732	£11.75	TDA2003	£0.95	BU426E	£0.80
AN5512	£2.95	BA6124	£2.50	HA11750	£5.00	LA4440	£2.50	STK441	£8.95	STK7308	£5.95	TDA2004	£1.95	BU500	£1.50
AN5515	£2.20	BA6208	£1.95	HA12002	£1.95	LA4445	£2.20	STK441	£8.95	STK7309	£6.50	TDA2005	£1.95	BU508A	£1.00
AN5521	£2.20	BA6209	£1.95	HA12003	£2.20	LA4446	£2.20	STK457	£7.50	STK7348	£4.95	TDA2006	£1.50	BU508D	£1.00
AN5612	£3.75	BA6218	£1.95	HA12045	£3.25	LA4460	£1.80	STK459	£7.75	STK7404	£6.95	TDA2020	£1.50	2N3055	£0.50
AN5613	£2.50	BA6219	£2.20	HA12046	£3.75	LA4461	£1.80	STK461	£8.50	STK8050	£9.50	TDA2030	£1.50	2N3773	£1.50
AN5620X	£3.50	BA6229	£2.20	HA13001	£1.90	LA4465	£2.30	STK463	£9.50	STK8250	£8.95	TDA2510	£3.95	2SA1106	£2.75
AN5622	£3.20	BA6238A	£1.95	HA13007	£4.50	LA4466	£2.30	STK465	£9.95	STK8260II	£12.50	TDA2600	£6.00	2SA1186	£3.95
AN5700	£1.75	BA6239A	£2.20	HA13008	£4.95	LA4500	£2.50	STK1050II	£7.25	STR370	£5.20	TDA2611A	£1.30	2SA1264	£1.95
AN5701	£1.20	BA6302A	£1.80	HA13118	£2.75	LA4505	£2.80	STK1060	£7.95	STR371	£5.20	TDA2653A	£3.50	2SA1489	£2.95
AN5722	£1.60	BA6304	£1.75	HA13403V	£5.50	LA4507	£2.50	STK1070II	£9.75	STR380	£5.20	TDA3500	£4.50	2SA1516	£2.50
AN5730	£1.85	BA6305	£1.95	KA2101	£1.95	LA4508	£2.50	STK2025	£7.50	STR361	£5.20	TDA3501	£4.50	2SB528	£0.60
AN5732	£1.85	BA6328	£2.20	KA2206	£1.75	LA4510	£1.75	STK2028	£7.50	STR440	£5.20	TDA3505	£4.20	2SB631	£0.60
AN5750	£3.75	BA6411	£2.20	KA2212	£1.20	LA4520	£1.50	STK2029	£6.50	STR441	£5.20	TDA3510	£	2SB775	£1.80
AN5753	£1.95	BA7005	£2.20	KA2261	£1.20	LA4570	£2.75	STK2038II	£9.50	STR450	£5.20	TDA3560		2SB863	£2.95
AN5900	£1.40	BA7023L	£2.50	KA2284	£1.20	LA6358D	£1.20	STK2048II	£9.75	STR451	£5.20	TDA3561A	£3.95	2SC1403A	£4.50
AN6130N	£2.50	BA7751AL	£1.95	LA1130	£2.50	LA7031	£2.60	STK2125	£6.75	STR453	£5.20	TDA3562A	£4.50	2SC1413A	£2.60
AN6136	£1.95	EXB341	£4.50	LA1135	£2.50	LA7032	£2.95	STK2129	£6.95	STR454	£5.20	TDA3650	£3.50	2SC1815	£0.10
AN6247	£1.75	HA1196	£1.75	LA1140	£2.20	LA7042	£2.80	STK2139	£8.00	STR435	£5.20	TDA3651	£2.70	2SC1913	£1.20
AN6250	£1.50	HA1197	£1.80	LA1150	£1.75	LA7520	£3.25	STK2155	£9.50	STR457	£5.20	TDA3651AQ	£3.50	2SC1969	£1.75
AN6310	£5.50	HA1199	£1.50	LA1170	£1.75	LA7530	£2.75	STK2230	£6.50	STR1096	£4.95	TDA3652	£2.75	2SC2166	£1.00
AN6326N	£3.50	HA1338	£2.95	LA1185	£1.60	LA7800	£1.50	STK2240	£9.50	STR2005	£5.95	TDA4500	£3.95	2SC235	£0.40
AN6327	£3.50	HA1339A	£3.50	LA1230	£1.50	LA7801	£1.50	STK2250	£9.50	STR2012	£6.20	TDA4501	£4.50	2SC2335	£1.20
AN6328	£3.50	HA1366W	£1.80	LA1231N	£2.00	LA7806	£2.50	STK3041	£6.50	STR2013	£5.20	TDA4503	£4.50	2SC2570	£0.30
AN6330	£2.95	HA1366WR	£1.85	LA1320	£1.60	LA7808	£2.75	STK3042	£6.50	STR3115	£5.95	TDA4505	£3.95	2SC2580	£2.75
AN6332	£4.75	HA1367	£3.50	LA1363	£1.20	LA7820	£2.75	STK3044	£5.75	STR3125	£6.20	TDA4510	£3.95	2SC2581	£2.95
AN6340	£3.75	HA1372	£2.95	LA1365	£1.50	LA7830	£2.20	STK3062	£6.75	STR4090	£6.20	TDA4600	£2.75	2SC2681	£2.80
AN6341N	£2.80	HA1374A	£2.50	LA1385	£1.95	LA7831	£2.50	STK3082II	£6.95	STR4211	£4.50	TDA4600-2	£2.50	2SC3153	£3.20
AN6342N	£2.50	HA1377	£2.20	LA1460	£2.50	LB1403	£2.20	STK3102II	£5.75	STR5015	£6.20	TDA4600-2D	£2.50	2SC3156	£3.70
AN6344	£4.75	HA1388	£2.95	LA2000	£1.75	LB1405	£2.20	STK3152II	£9.50	STR5412	£5.20	TDA7250	£4.95	2SC3281	£2.95
AN6346N	£3.75	HA1392	£2.20	LA2100	£2.20	LB1416	£1.50	STK4017	£5.75	STR6020	£5.20	TDA7270S	£2.20	2SC3300	£2.95
AN6356N	£3.85	HA1394	£2.50	LA2200	£1.50	LB1640	£2.20	STK4025	£6.50	STR50020	£6.20	UPC575C	£1.00	2SC3409	£2.75
AN6357N	£4.50	HA1396	£3.75	LA2400	£1.50	LB1649	£2.50	STK4121II	£6.95	STR50103A	£5.50	UPC1025H	£2.30	2SC3466	£2.95
AN6359N	£5.50	HA1397	£2.50	LA3101	£1.75	LC7137	£4.50	STK4122II	£5.95	STR54041	£6.20	UPC1156H	£3.50	2SD358	£0.60
AN6360	£2.60	HA1398	£2.50	LA3160	£0.95	LC7363	£3.75	STK4131II	£6.75	STR58041	£6.20	UPC1185H	£2.50	2SD371	£2.50
AN6362	£4.50	HA11122W	£2.95	LA3161	£1.20	LC7800	£3.75	STK4132II	£6.75	TA7193P	£4.00	UPC1188H	£2.75	2SD424	£3.95
AN6371	£3.25	HA11211	£2.30	LA3201	£0.95	LC7815	£3.75	STK4141II	£7.50	TA7205AP	£1.00	UPC1191V	£1.20	2SD476	£1.00
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AN6562	£1.50	HA11219	£1.75	LA3220	£1.50	LM3914N	£2.75	STK4142II	£7.30	TA7222AP	£1.30	UPC1230H	£2.50	2SD600	£0.70
AN6610	£1.80	HA11221	£2.20	LA3300	£1.65	LM3915N	£2.75	STK4151II	£7.50	TA7229P	£3.25	UPC1237H	£2.20	2SD768	£1.20
AN6671K	£4.95	HA11223W	£2.50	LA3301	£1.30	M5218L	£1.95	STK4152II	£7.85	TA7230P	£1.50	UPC1241H	£1.95	2SD811	£2.95
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AN6876	£1.50	HA11227	£2.20	LA3361	£1.20	M51104L	£3.20	STK4171II	£8.85	TA7240AP	£2.95	UPC1278H	£2.50	2SD1207	£0.60
AN7062	£2.75	HA11235	£1.95	LA3370	£2.50	M51358P	£1.75	STK4172II	£8.95	TA7241AP	£2.95	UPC1288V	£2.75	2SD1275	£1.00
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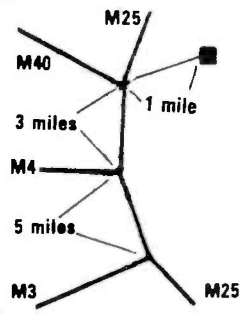

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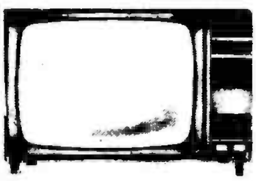

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2SA-771	150p	2SB-757	130p	2SC-1447	60p	2SD-1265	100p
2SA-794	60p	2SB-772	50p	2SC-1454	350p	2SD-198	200p
2SA-798	60p	2SB-837	60p	2SC-1509	45p	2SD-200	310p
2SA-808	150p	2SB-857	60p	2SC-1567	60p	2SD-235	40p
2SA-817	25p	2SC-352	70p	2SC-1568	60p	2SD-288	80p
2SA-844	15p	2SC-372	15p	2SC-1577	770p	2SD-299	160p
2SA-850	80p	2SC-380	25p	2SC-1550	60p	2SD-313	40p
2SA-893	30p	2SC-458	20p	2SC-1514	75p	2SD-315	75p
2SA-896	35p	2SC-460	10p	2SC-1584	550p	2SD-325	45p
2SA-916	30p	2SC-495	65p	2SC-1586	550p	2SD-352	50p
2SA-921	10p	2SC-496	80p	2SC-1627	30p	2SD-357	40p
2SA-940	50p	2SC-497	150p	2SC-1667	140p	2SD-358	40p
2SA-950	25p	2SC-536	20p	2SC-1669	85p	2SD-381	90p
2SA-958	75p	2SC-644	30p	2SC-1670	85p	2SD-386	80p
2SA-968	75p	2SC-681	195p	2SC-1675	20p	2SD-388	180p
2SA-985	65p	2SC-693	100p	2SC-1722	60p	2SD-389	100p
2SA-992	30p	2SC-710	25p	2SC-1756	60p	2SD-400	20p
2SA-1048	20p	2SC-717	45p	2SC-1760	85p	2SD-401	50p
2SA-1060	150p	2SC-733	30p	2SC-1775	15p	2SD-426	150p
2SA-1062	120p	2SC-738	30p	2SC-1815	15p	2SD-428	150p
2SA-1094	250p	2SC-741	195p	2SC-1819	75p	2SD-438	50p
2SA-1102	190p	2SC-783	110p	2SC-1845	20p	2SD-468	30p
2SA-1104	205p	2SC-789	50p	2SC-1875	240p	2SD-476	60p
2SA-1106	200p	2SC-790	90p	2SC-1890	20p	2SD-478	100p
2SA-1110	45p	2SC-828	25p	2SC-1906	35p	2SD-525	75p
2SA-1142	290p	2SC-829	25p	2SC-1913	100p	2SD-526	75p
2SA-1145	60p	2SC-839	30p	2SC-1914	30p	2SD-600	90p
2SA-1147	190p	2SC-929	20p	2SC-1922	250p	2SD-612	40p
2SA-1156	60p	2SC-930	20p	2SC-1941	65p	2SD-613	100p
2SB-545	150p	2SC-941	30p	2SC-1942	270p	2SD-669	45p
2SB-546	100p	2SC-945	20p	2SC-1986	60p	2SD-716	125p
2SB-548	40p	2SC-959	65p	2SC-2003	60p	2SD-718	125p
2SB-555	150p	2SC-998	60p	2SC-2022	60p	2SD-733	230p
		2SC-1012	90p	2SC-2073	75p	2SD-745	250p
		2SC-1018	90p	2SC-2120	15p	2SD-748	150p
		2SC-1030	220p	2SC-2229	30p	2SD-761	50p
		2SC-1050	320p	2SC-2236	30p	2SD-822	450p
		2SC-1060	90p	2SC-2240	25p	2SD-837	95p
		2SC-1061	90p	2SC-2274	30p	2SD-838K	475p
		2SC-1096	75p	2SC-2278	75p	2SD-845	275p
		2SC-1106	210p	2SC-2275	60p	2SD-850	260p
		2SC-1115	290p	2SC-2320	25p	2SD-859	100p
		2SC-1116	290p	2SC-2335	125p	2SD-869	320p
		2SC-1162	40p	2SC-2371	60p	2SD-880	50p
		2SC-1172	190p	2SC-2427	80p		
		2SC-1173	50p	2SC-2482	50p		
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DUBLE 7 SEG Displays	15p
LN5 26RA	or 10 for £1

Philips Digital Multimeter with memory and auto ranging 5BC812 £63.00

PHILIPS
25 Watt Solder Iron £4.00

Various Tools and Accessories

Self adjusting cutter stripper	£5.00
10 mixed tube bars	£4.00
5000 Diodes-Resistors	£3 pack
T/V V/Aerial 300Ω or 75Ω	£1.50
* D/P push mains switch	20p each
Mains lead & two pin socket for radio cassette	35p
T/V loop aerial	75p
Radio Telescopic Aerial	£1.00
Philips Neon Lamps for TV sets	5p
Freeze Philips	£1.20
Foam Cleaner Philips	£1.20
Contact Cleaner Philips	£1.20
Cans of Anti Static, Degrease Cleaner and Anti Corona	All at £1.40
Lorlin Full Remote Relay Switch fit most T/V sets, mains 4 tag, 2 tag 12 volt	£1.00
Mains timer. 13 amp — up to 2 hours: easy to use, plugs into socket	£3.00
Screen locking agent, large can	£1.50
Red E.H.T. LEAD and Anode Cap	£1.00
Weller solder iron 25 watt	£4.00
Hitachi Silver Oxide Battery G13 UCC357 IEC SR44 1.5V	60p
100 Coax Plugs	£12.00
De-solder pump + 2 nozzles Philips	£4.00
Flat Red LED and Green	5p
500gm 60/40 solder reel	£6
Solder 1 kilo reel	£5.50
Dual v/u meter -20 – +10db	£1
K30 thermistor 232266298009	75p
De-solder Pump	£2.50
Portasol Flameless Gas Soldering Iron	£16.00
Green & Red. LED pack mixed	100 for £1.00
Hill Meter Leads. S/Rubber and Probes	£4.00

HILLS

Miniature Linesman Pliers £2.20
Miniature Side Cutters £2.20
Miniature Pliers £2.20
Miniature End Cutters £2.20

KT3 PANELS

Sound Output RGB Output Chroma Panel. I.F. Panel and Line OSC £7.00 each

MOD KIT PHILIPS VHS VCR

VR6467 or VR6760 and derived types gear box £19.50

PYE 6 Key Switch & Panel G11 Front Panel £10

SONY 1400KV Chroma Panel £6
SONY 1400KV Touch button unit £3.50

GEC Decoder Panel PC772A3 PC446A5 £6

12 Volt Mains Trans 500M/A £1.00

Quantity Reductions

BY204/4	25 for £1.00
BY206	25 for £1.00
KT3 touch button black	6 for £1
G11 touch button red	6 for £1
K30 full remote Dawer Ass with 3 I.C.	£7.00
K30 VHF. UHF Dawer Ass	£6.00
BY298 3 amp/fast/R	20 for £1.50
OA90-OA91	40 for £1.00
50 Ceramic Condensers	£1.50
Mixed Mounting Kit for Power Transistors	50p
300 Condensers	£1.50
300 Resistors	£1.50
150 Electrolytics	£2.00
15 Bulbs Philips	40p
GEC-Hitachi Thick Film Frame	£5

Mixed Packs

TO66 12 Power Trans RCA 16182 NPN Replacement for BD124 and Mounting Kits	£1.00
25 Panel Mount Bulbs & Neons	£1.50
10A	£1.50
25 LED red/yellow/green	£1.50
20I/C Holders	£1.20
20 Large LED Red	£1.00
20 Small LED Red	£1.00
10×20 Turn 100K Pots	£1.00

Mixed 100 Transistor B.F. and B.C. and PET £1.50 1000 for £10.00

12 Volt 4 Amp Video Battery Pack 10 of Type D Cells £8.50

40 glass reed switch	£1
10 press to make switch	70p
40 Pots	£1.50
With Focus Pin, 10 Tube Bases, mixed	£2.00
1,000 Diodes, Condensers, Resistors on Bandolier	£1.00
20mm Fuse Holders	
Chassis Mount	20 for £1
EHT Diodes, small	20 for £1

300 Mixed Diodes £2

100 500M/A Fuse £1
Mixed V/Cap Pots ITT-GEC-Hitachi-Philips etc. 20 for £1
ITT Mains Switch with Remont CMC113 £1

SENDZ COMPONENTS
TO ORDER SEE BACK PAGE

12v DC relay 1½×1½×2 print type 10 amp D.P. change over £1